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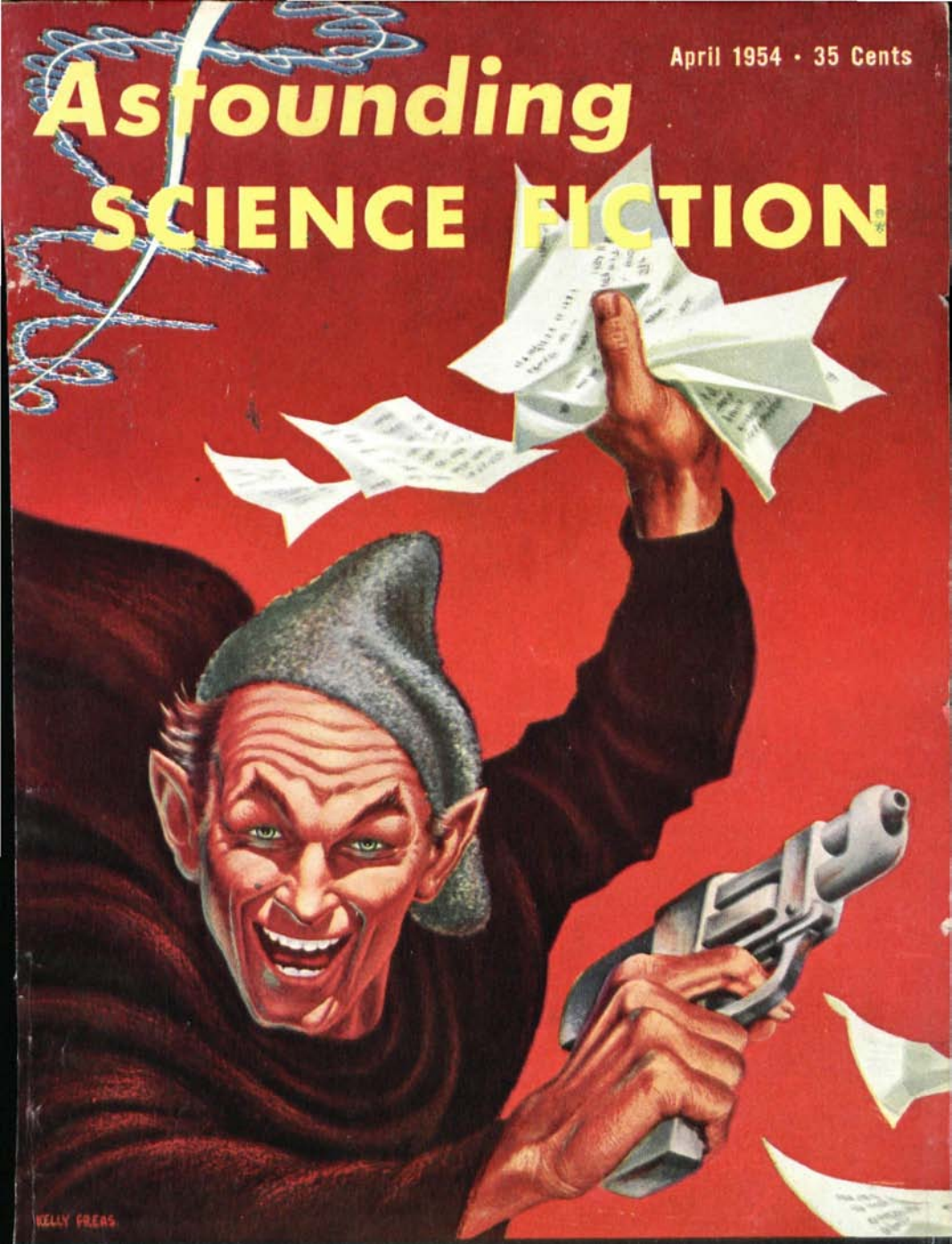

Fighting Philosopher

NOVELET BY E. B. COLE

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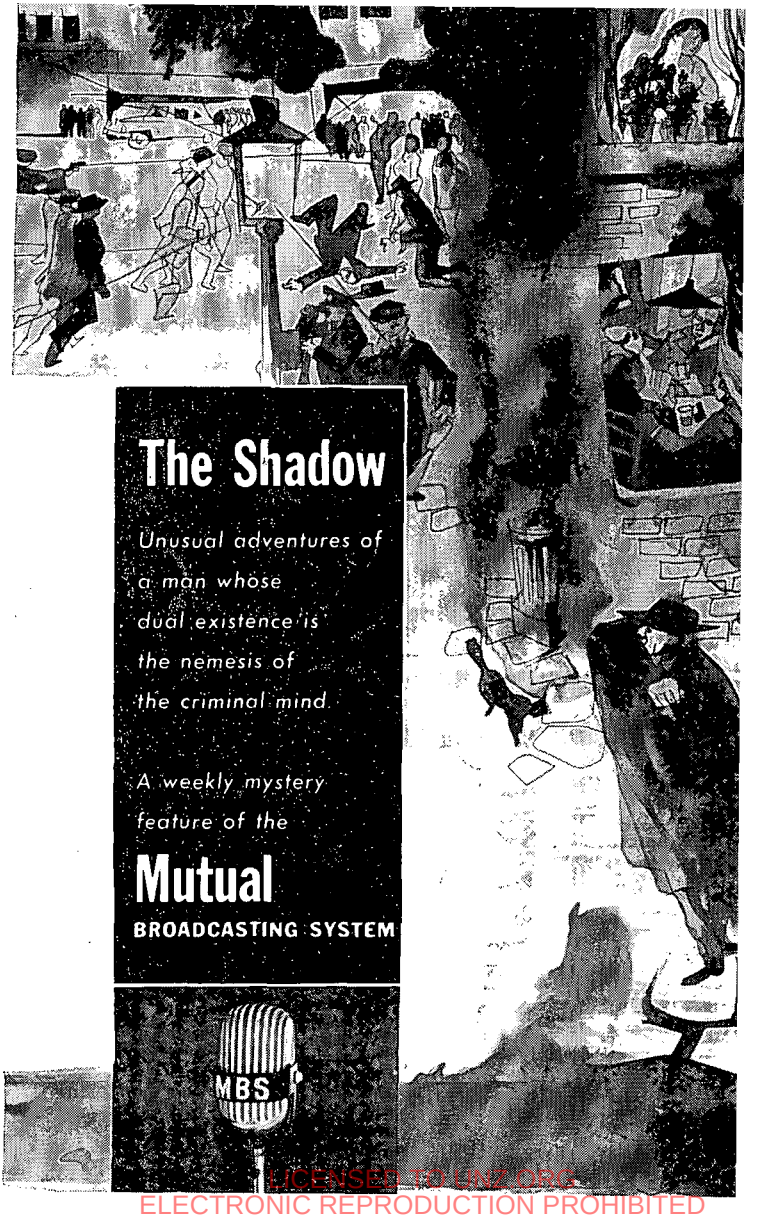

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Astounding
SCIENCE FICTION

VOLUME LIII • NUMBER 2 **April 1954**

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EDITORIAL

INFORMATION ON AGE

One of the most frustrating possible situations is that of the man who's working diligently on a problem—using a method which, unknown to him, is inherently incapable of solving the problem.

Some classic examples of that sort of situation are readily available. Lord only knows how many man-lifetimes of effort were expended by alchemists seeking to transmute base metals to gold by chemical processes; inasmuch as we now know that *no* chemical manipulation can affect the nucleus of the atom, their efforts were foredoomed to inevitable and inescapable failure.

Also unknown is the number of man-lifetimes expended by geometers over the last two thousand years on efforts to trisect the angle by the classic Greek method—constructions using only compass and straight-edge. It was relatively recently that mathematical proof was developed which showed that the job could never be done—using that method.

When any scientist tackles any problem, he must always have nagging at the back of his mind the question whether the method is competent. The scientist who succeeds in solving his problem the first time he tries, of course, doesn't have that worry; he also has rather incredible good luck. Normally success comes, even in the happiest of cases, only after a series of tries. During the period of trial-and-failure, there is the question "Am I incompetent, stupid, or inept, or is the method I'm seeking to use inherently incompetent—an angle-trisecting problem?"

Unfortunately, the usual situation is that the knowledge necessary to determine that question doesn't become available until many years, or even centuries, later.

Claude Shannon, some years back, developed a new, basic philosophical tool, "Information Theory"; it's my personal opinion that we haven't begun to learn how to use that exceed-

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ingly powerful method of attack on the Problem of Problems. It's being used currently in studying communication engineering, and in computer machine design—but I believe it needs to be applied in many other areas. I'd include in that basic theoretical physics, medicine, psychology, art and literature as well as the obvious need for basic studies of communication in international relations. My personal feeling is that the work will turn out to be basic and important enough to win a Nobel Prize—but I don't know whether this will first be recognized by a prize in Medicine, Literature, Peace, or Chemistry! Information Theory, somewhat like Logic, is applicable in *all* fields of human study.

In some respects, Information Theory is a more fundamental philosophical tool than is logic itself; logic is one of the several possible methods of being rational, and Information Theory shows that Logic, like Euclidean Geometry, is not and cannot be accurately descriptive of the real Universe! It's evident in Information Theory that all real physical systems contain noise. But Logic is a non-physical system, and is noise-free. Therefore, the two systems—the real Universe and Logic—cannot be congruent.

Until thinking becomes rational enough to include the effect of noise, to acknowledge that noise is inherent in the Universe, and *not* just an accident, theory cannot be made to correspond with fact. You're also apt to get some remarkably futile wild-goose chases when someone seeks to isolate and purify an effect which is, actually, due to noise. Noise, when purified, ceases to be noise—it becomes information!

The most-liked musical instruments, for example, are perfect examples of precisely that process. When a rosined bow is drawn across a stretched string, there is a very high *stiction* effect; the bow sticks because of the rosin, then when the displacement is great enough, the tension suddenly frees the string and it snaps back. The process generates a noise vibration in the string. A violin is carefully designed to select certain pure tones from the noise generated.

The piano operates by hammering a string. The hammering generates noise; the string selects certain pure fractions from it. The result is music.

A cornet is a device for selecting certain related frequencies by means of resonant air columns in brass tubes, from about the purest noise a man can produce—without the cornet it's a Bronx Cheer.

Perhaps the answer to the situation is: "Since noise is inherent and unavoidable in the Universe, let's recognize it's there and find a way to make it useful and pleasant." The cornet converts a Bronx Cheer into beautiful music; the violin does as much for the sort of noise a squeaky, scraping door generates. Given time and persistence,

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a music teacher can do much the same for a small boy's tendency to pound on tin cans and wooden fences.

It is fully agreed that the ancients who invented the violin and the trumpet didn't use Information Theory to do so. It is, however, suggested that they could have gotten there a lot easier if they'd known about it and applied it. The theory of resonance would have helped a lot, too. Whether Man knows it or not, Universal Laws exist; Man simply uses them. Ug, the cave man, knew nothing about the chemistry of complex proteins, but he did tricks with protein synthesis that the greatest chemist today can't duplicate in a laboratory. He could take any of a vast range of complex protein materials, gently disentangle the amino acids without destroying them, and reassemble the amino acids again into specific compounds of human metabolism. You don't *have* to know how you do what you do—but it helps a lot.

I believe Information Theory could be applied most usefully indeed to the biological sciences—genetics and biochemistry alike. The theory of mutation, for instance, could be helped along by an Information Theory approach. Essentially, the genetic structure of a cell can be considered a recorded message, containing information, an essay entitled "How To Live on The Planet Earth." Several different versions of the essay exist; there's a whole group of them on the theme "How To Live By Hunting Animal Food" and others with the theme "How To Live By Converting Sunlight To Food."

Some two or three billion years ago, some living thing discovered a certain relationship between the water molecule and the carbon dioxide molecule. Carbon dioxide can be hydrated to form carbonic acid; carbonic acid can be reversibly dehydrated to form carbon dioxide and water. It is exceedingly important to living organisms that this reaction go rapidly; enzymes capable of accelerating the hydration and dehydration are essential.

For some two trillion years or more, the information on "How To Handle Carbon Dioxide" has been transmitted successfully from generation to generation. No single recording of that message has come down; instead, the message has been transmitted across that vast span of time by a system quite familiar to the communication engineer—the relay-repeater technique.

In transmitting television signals across the continent, no one transmitter can throw a signal powerful enough to reach the three thousand miles or so; at the other side of the continent the signal would be lost in the vast quantity of atmospheric noise. So they have set up a series of relay-repeater stations.

The message on the CO_2-H_2O interaction couldn't be transmitted successfully over the two trillion year

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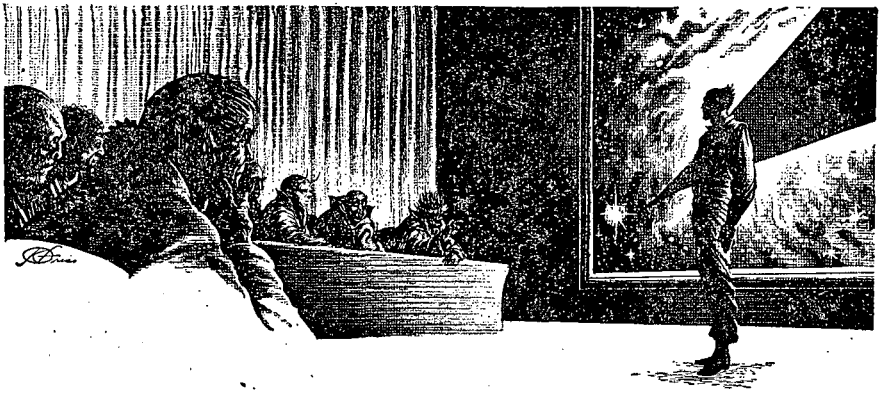

FIGHTING PHILOSOPHER

***Archimedes** was the philosopher who wouldn't bother to fight the Roman soldier and had his philosophical work terminated permanently. A true philosopher avoids brawls but is a deadly effective fighter for all of that.*

BY E. B. COLE

Illustrated by Freas

". . . And this, gentlemen, is what we saw from the *Rilno.*"

The three-dimensional screen glowed as a dozen suns sprang into being within it. Light glanced fitfully from a multitude of spheres grouped about their primaries. These were the suns and planets of the Empire of Findur. Near the center of the screen, a number of small sparks dodged swiftly about in the emptiness of interstellar space. One of these seemed to be surrounded. Tiny lines of light swept from the others, causing the central spark to pulsate with a vivid glow.

"Captain Tero called me at this time," announced the voice from the darkness beside the screen. "He requested permission to cut a ten-degree, four-microsecond void, since he was englobed and his screens were in danger of overloading under the Finduran fire." The speaker paused, then continued. "I granted permission, since I could see no other feasible means of pulling him out of the globe. We

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could have opened fleet fire, but Tero's screens might have gone down before we could control the situation. The *Kleeros* acknowledged, then Tero cut in his space warp."

On the screen, a narrow fan of darkness spread from the englobed spark. The attacking sparks vanished before it. Suddenly, the dark fan widened, vibrated, then swung over a wide angle. As it swung, the brilliant suns went out like candles in a high wind. A black, impenetrable curtain spread over most of the scene. Abruptly, the spark at the origin of the darkness faded and was gone. The scene remained, showing an irregularly shaped, black pocket amongst the stars. It hung there, an empty, opaque, black spot in space, where a few moments before had been suns and planets and embattled ships.

"As you gentlemen know," the voice added tiredly, "before a space warp can be cut in, all screens must be lowered to prevent random secondary effects and permanent damage to the ship. The cut is so phased as to make it virtually impossible for a shear beam or any other force beam to penetrate, but there is one chance in several million of shear-beam penetration while the warp is being set up. The only assumption we could make aboard the *Rilno* was that a beam must have struck Tero's controls while his screens were being phased. He apparently swung out of control for a moment, then disrupted his ship to prevent total destruction of the Sector. Before he could act, however, he had destroyed his attackers and virtually all of the Finduran Empire. Of course, the warp remained on long enough to allow permanent establishment. We have nothing further to base opinions on, since Tero did not take the time to report before disrupting." The scene on the viewer faded and the room lights went on.

The speaker stood revealed as a slender, tall humanoid. His narrow face with its high brows and sharply outlined features gave the impression of continual amusement with the universe and all that was in it, but the slight narrowing of the eyes—the barely perceptible tightening of the mouth—evidenced a certain anxiety. Fine lines on his face indicated that this man had known cares and serious thoughts in the past. Now, he stood at attention, his hands aligned at the sides of his light-gray trousers. Fleet Commander Dalthos A-Riman, of the Seventeenth Border Sector, awaited the pleasure of the Board.

In front of him, the being at the desk nodded at the other members of the Board. "Are there any questions, gentlemen?"

A small, lithe member raised a hand slightly. A-Riman looked toward him. He had met Sector Chief Sesnir before, and knew his sharp, incisive questions.

"You said that Captain Tero was at

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point, commander," stated Sesnir. "How did he happen to get so far in advance of the rest of the fleet that he could be englobed?"

"You remember, sir," replied A-Riman, "the Findurans had developed a form of polyphase screen which made their ships nearly undetectable when at rest. We could only detect them when they were in action, or when they were within a half parsec. This encounter took place several parsecs outside their normal area of operation." The fleet commander brought a hand to his face, then dropped it. "I was just about to call Tero in to form a slightly more compact grouping when he ran into the middle of their formation."

"You mean they had maneuvered a fleet well inside Federation borders, and had it resting in ambush?" persisted the questioner. "What was wrong with your light scouts?"

"That, sir," A-Riman told him, "was the reason I approached in fleet strength. I had received no scout reports for three days. I knew there was enemy action in the region, but had no intelligence reports."

"You mean," another Board member broke in, "you went charging into an unknown situation in open fleet formation?"

"I felt I had to, sir. I regarded open formation as precautionary, since damage to one ship would be far less serious than involvement of the entire fleet in an ambush. I was sure I had lost several scouts, and was not inclined to lose more. Tero volunteered to draw fire, then planned to take evasive action while the rest of the fleet moved in." A-Riman paused. "Except for superb planning by the Finduran admiral and a million-to-one accident, Tero would have extricated himself easily, and we could have moved in to take police action in accordance with the council's orders."

"I see," commented the questioning member. "Probably would've done the same thing myself."

"Why," demanded Sesnir impatiently, "didn't you simply open up from a safe distance with a ten-microsecond, forty-degree space warp? You'd still have been within your orders, we'd have saved a ship, the Findurans would've given us no more trouble—ever—and we wouldn't have a permanent space fold to worry about in Sector Seventeen."

A-Riman looked at the sector chief. "That, sir," he announced firmly, "is just what I wanted to avoid doing. I felt, and still feel, that complete destruction of suns, planets and youthful cultures, however inimical they may seem to be at the time, is wasteful, dangerous, and in direct violation of the first law of Galactic Ethics."

The president of the Board looked up. "The Ethic refers to Federation members, commander," he said. "Remember?"

"I believe it should be extended to include all intelligent life, sir," A-

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Riman answered.

"You will find, 'Treat all others as you would wish yourself to be treated in like circumstances,' a very poor defense against a well directed shear beam," commented Sesnir.

A-Riman smiled. "True," he admitted, "but there are possibilities. Why—"

Vandor ka Bensir, Chief of Stellar Guard Operations, rapped on his desk. "Gentlemen," he said dryly, "a discussion of the Galactic Ethics is always very interesting, but I believe it is out of order here. Unless there are more questions or comments pertinent to this inquiry, I will close the Board." He looked about the room. "No comments? Then, as president of this Board of Inquiry, I order the Board closed for deliberation." Again, he rapped on the desk. "Will you please retire, Commander A-Riman? We will notify you when we have reached our findings and recommendations."

As the door closed, Bensir turned to the other Board members. "The floor is open for discussion," he said. "You're the junior member, Commander Dal Klar. Do you have any comments?"

"Admiral, I have what almost amounts to a short speech." Dal Klar glanced at the chief of operations, then looked slowly about at the rest of his colleagues. "But I hesitate to take up too much of the Board's time."

Ka Bensir smiled gently. "You mean that juniors should be seen and not heard?" he queried.

"Something like that, sir."

"This Board," ruled its president, "has all the time in the Universe. You can think out loud; you can bring up any points you wish; you can come to whatever conclusions you want to. The floor is yours."

Dal Klar took a deep breath. "Well, in that case, here I go: In the first place, I feel that A-Riman acted properly and in accordance with his ethics and those of his civilization. If you gentlemen will remember, A-Riman is from the Celstor Republic, which is one of the older members of the Federation. The Celstorians have been responsible for many of the scientific advances and for a large share of the philosophy of our civilization. A-Riman, himself, has written two notable commentaries on philosophy and ethics, both of which have been well received in the Federation."

Dal Klar glanced toward Sector Chief Sesnir, then continued. "Had the commander destroyed without warning, inflicting utter and complete destruction upon a young and comparatively helpless civilization, he would have been acting in direct contravention to his own stated ethical code. In that case, he would have been deserving of all the censure we could give. As it is, I feel that he acted in accordance with the best traditions of the Guard, and simply met with an unforeseen and unfortunate accident which could have happened to any

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fleet commander who went on that mission."

Dal Klar paused, cleared his throat, then concluded. "We have heard definite testimony that there was no laxity in drill or maintenance in A-Riman's fleet. On the contrary, some of his officers feel that he is extremely strict about both action drill and maintenance. Certainly, then, we can't say he was negligent."

As Dal Klar stopped, ka Bensir looked at another Board member, who shook his head.

"I might have phrased it a little differently, sir," he commented, "but the commander expressed my views quite well. I have nothing to add."

Two more members declined to comment, then Sector Chief Sesnir wagged his head.

"I seem to be in the minority," he remarked, "but I feel that the coddling of these young, semibarbaric and aggressive cultures is suicidal. Before we could teach them our ways of thinking, they would inflict tremendous damage upon us. They might even subvert some of our own younger members, and set up a rival Federation. Then, we would have real trouble. I have read A-Riman's commentaries on ethics, and I know the history of the 'Fighting Philosopher.' Frankly, I feel that a man with his views should not be in the Combat Arm of the Guard. He is simply too soft."

The Board president nodded. "I'll reserve comment," he decided. "Will you gentlemen please record your findings?"

A few minutes later, the clerk inserted a small file of recordings into the machine in front of him. The viewscreen lit up.

Findings: The Kleeros, *a Class A Guard ship, was lost, and a permanent space-fold was set up in Sector Seventeen due to the ill-advised tactics of Fleet Commander Dalthos A-Riman, who risked his fleet against an unscouted force rather than destroy a criminal civilization by means at his hand.*

Ka Bensir pointed at Dal Klar, who shook his head. "No," he said decisively. The pointing finger moved to the next member. Again, the answer was a definite "No." Only one member assented to the proposed finding. Ka Bensir nodded to the clerk. "Next recording," he said.

Findings: The Class A Guard ship, Kleeros, *was destroyed by its captain to avert major disaster. The cause of failure of the space-warp controls aboard the* Kleeros *cannot be accurately determined due to the destruction of the ship with all on board and to the lack of communication prior to that destruction. Fleet Commander Dalthos A-Riman was acting within his orders and was using reasonable caution prior to the incident. The failure of the space-warp controls and the permanent space-fold resulting therefrom could not have been foreseen by the fleet commander or by Captain Nalver Tero. Since the use of the space-*

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warp is recognized as a legitimate defensive tactic by single ships of the Federation, no censure will be brought against Captain Tero for requesting permission to use the warp, nor against Commander A-Riman for granting that permission. The disaster was due to circumstances beyond the control of any of its participants.

Again, Ka Bensir pointed at Dal Klar, who nodded. "I agree," he said. The next member assented. So did the next, and the next. Finally, Ka Bensir rapped on his desk. "The findings are complete, then," he said. "Since we find that no censure will be brought against Commander A-Riman, we need not go into that phase of the matter. Do I hear a verbal motion on a citation for Captain Tero and his crew?"

"Federation Cluster for Tero; Heroic Citations for his crew," rumbled a deep voice. "Second," came a sharp reply.

"All in favor?" An assenting murmur arose. "Unanimous," commented Bensir. "Record it."

Vandor ka Bensir drew his side arm. "Have Fleet Commander Dalthos A-Riman come in," he ordered. He laid the weapon on his desk, its needlelike nose pointing away from the door and toward the screen which still bore the accepted findings of the Board and the posthumous citation for the captain and crew of the *Kleeros*.

A-Riman stepped in. Glancing at the weapon on the desk, he nodded slightly, then looked at the viewscreen. "Thank you, gentlemen," he acknowledged. "Now that the inquiry is over, I wish to request reassignment to the Criminal Apprehension Corps. I feel that I may be more useful there than in the Combat Arm." He nodded at the screen. "In spite of the recorded findings, it is possible that some of you agree. My real reason, however, for requesting reassignment, is my feeling that I may be able to offer some constructive recommendations which should result in fewer problems for the Combat Arm in the future, and I wish to be in Criminal Apprehension where I can furnish practical proof of the feasibility of those recommendations."

The Tenth Sector Officers' Club wasn't particularly crowded. Commander A-Riman walked into the Senior Officers' dining room. At one of the tables, he saw two old acquaintances. He went toward them.

"Mind if I join you?"

They looked up. "Dalthos," exclaimed one, "where'd you come from? Thought you were over in Seventeen."

A-Riman grabbed a chair, pulling it out. "Just reported for duty, Veldon," he remarked as he sat down. "I'm the new CAC Group Commander."

Veldon Bolsein looked at him quizzically. "Heard you had a little trouble with a runaway warp," he

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remarked. "What'd they do, damp your beams?"

"No, they decided I wasn't at fault," grinned A-Riman. "I requested transfer to CAC."

Bolsein cocked one eyebrow up and the other down. Then, tilting his head to one side, he looked hard at A-Riman. "My hearing must be going bad," he decided. "I was sure you said you requested transfer."

"I did."

"How barbarous," murmured Fleet Commander Plios Knolu, as he placed his elbows on the table. He leaned forward, cupped his face in his hands, and fixed A-Riman with a pitying stare. "Tell me," he asked, "did they beat your brains out with clubs, or did they use surgery?"

A-Riman leaned back and laughed. "Thought you'd have lost your touch by now," he remarked. "No, I'm still sane as ever, but—"

"Jets ahead," warned Bolsein softly. He started to rise. A-Riman glanced around to see the sector chief walking into the room. He and Knolu got to their feet.

Sector Chief Dal-Kun took his seat at the head of the table. "Your health, gentlemen," he greeted them. "I see you have already met." He looked over the menu card and dialed a selection. "I've been checking over your records, A-Riman," he continued. "Look good, all of them, up to that space-fold. Board didn't hold you responsible for that, either." He paused as his dishes rose to the table top. Lifting a cover, he examined the contents of a platter. "Food Service is in good condition, I see," he remarked. He transferred a helping to his plate. "Can't understand how you happened to go into Criminal Apprehension, though. No promotion there."

A-Riman smiled. "I was just about to explain to Bolsein and Knolu when you came in, sir." He paused, collecting his thoughts. "I've been doing some thinking on criminology for quite a while, and I've a few theories on preventative work in the new civilizations I'd like to try out. There are several systems in this sector that would stand some investigation, and—"

Dal-Kun laid his utensils down. "Let's not get in too much of a hurry, commander. Suppose you turn in some good, routine work for a couple of cycles or so, then we'll talk about new theories." He picked up his fork again. "We've got a lot of these young, do-nothing Drones roaming about in this sector, getting into scrapes, violating quarantines, creating space hazards. They'll keep you busy for a while." He grunted angrily. "Why, right now, you've got five pickup orders on file, and those people of yours can't seem to get anywhere with them."

"In that case, I'll get to work immediately," said A-Riman. "Can I have Fleet Support where necessary?"

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The sector chief grunted again. "Don't see why not. Commander Knolu hasn't done anything but routine patrol for two cycles. Do him good to run around a bit and work off some of his fat." He continued with his meal.

Finally, the chief left the table. Bolsein dialed another glass of *Telon* and leaned back. "Don't worry too much about the boss," he remarked. "He snarls like mad, but he'll back you up all the way, long's you're somewhere near the center of the screen."

"Just what's this big, new idea of yours, A-Riman?" inquired Knolu.

"Either of you ever get a 'cut back, or destroy' order?"

Knolu nodded. "Sure—several of them. Last one was in this sector, not more than ten cycles ago."

"How did you feel about it?"

Knolu shook his head. "How does anyone feel about destruction? I hated it, but the council doesn't put out an order like that unless it has been proven necessary. They hate destruction and waste, too."

"Suppose we could figure out a method of eliminating most of this type of destruction?"

Bolsein narrowed his eyes. "It would take a terrible load off the mind of every combat commander." He sighed, "But what can be done? We contact new civilizations as soon as they achieve space travel, and the negotiators fail with a good share of them. Pretty soon, they're too big for their system. They try to take over the Federation, or part of it, and we're ordered into action."

"Suppose we contacted them long before they came out into space?"

"Unethical. You know that."

"Is guidance and instruction unethical?"

Knolu sat up sharply. "I think I see what you're driving at," he said, "but who's going to spend his time and effort on a primitive planet, living with primitive people, just so he can teach them? What guarantee has he of success?"

A-Riman smiled. "You heard the chief. I've got five pickups in the files. I'll bet, without looking, that three of them at least are for quarantine violations on primitive planets. Now—"

Bolsein interrupted. "All five of 'em are," he grumbled. "We have more trouble in this sector with these foolish Drones violating quarantine than we do with anything else. I even had a minor engagement with a bunch of them last cycle. They'd organized some sort of an eight-way chess game, with the planetary population as pieces." He hesitated. "What a nasty mess that was," he added. "My captains were so disgusted, they didn't pick them up for rehabilitation; they just blasted them out of space. I lost a ship, too, over the deal."

"There," announced A-Riman, "you had quite a few people who were will-

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ing to live with primitives on a primitive planet."

"Sure," grunted Bolsein. "Drones, though."

"What is a Drone?"

Knolu leaned back, smiling. "I read the manual once, too, remember?" He folded his arms. "'A Drone,'" he quoted in a singsong voice, "'is an entity who prefers not to do anything productive. Having acquired the necessary equipment for subsistence, he devotes his time to the pursuit of pleasure, to the exclusion of all other activity.'" He sat forward again. "I've gotten a few more thoughts on the subject, though. In my opinion, a Drone is an entity which should be picked up for rehabilitation as soon as he shows his characteristics."

He held up a hand as Bolsein started to speak. "Oh, I know, the Ethic says we should not interfere with the chosen course of any citizen so long as he does no harm, commits no unethical act, or interferes with the legitimate good of no other citizen, but this should be an exception. Most Drones tire of normal pleasures in a few cycles. Within a hundred cycles, they turn to exotic pleasures. Finally, they tire even of these, and get into some form of unethical, immoral, or downright criminal activity. Eventually, we have to pick most of them up anyway, so why not pick them up right away?"

"More than a thousand periods ago," commented A-Riman, "long before the Celstorians burst out into space, my planet had a problem like this. To be sure, it was on a much smaller scale, but there were similarities. The governors set up a sort of 'Thought Police,' to combat the evil at its roots. It led to a dictatorship, and the civilization of Celstor was set back a thousand planetary cycles. We almost reverted to barbarism, and the matter wasn't corrected until a planet-wide uprising overthrew the Board of Governors and destroyed the Police State. Finally, the Republic was founded, but not until many sterile reversions had been set up and overthrown. No, we don't want to amend or correct the Ethic. We merely need to extend it."

He looked at Knolu. "But to get back to my original query. In my opinion, a Drone is an entity whose original training was somehow less than completely successful. He is an entity who wishes excitement—action, if you will—but is unable to accept the discipline which goes with productive work. At the present civilization level, subsistence is easy to get, on almost any desired scale. Matter converters allow us to live wherever we are, and live well. Subsistence and property then are no incentives. Most of us, who are well oriented, get our pleasure and our reward from a feeling of accomplishment. The Drone, however, has not yet reached that stage of development. It is only when his pursuit of pleasure has led him far out of the

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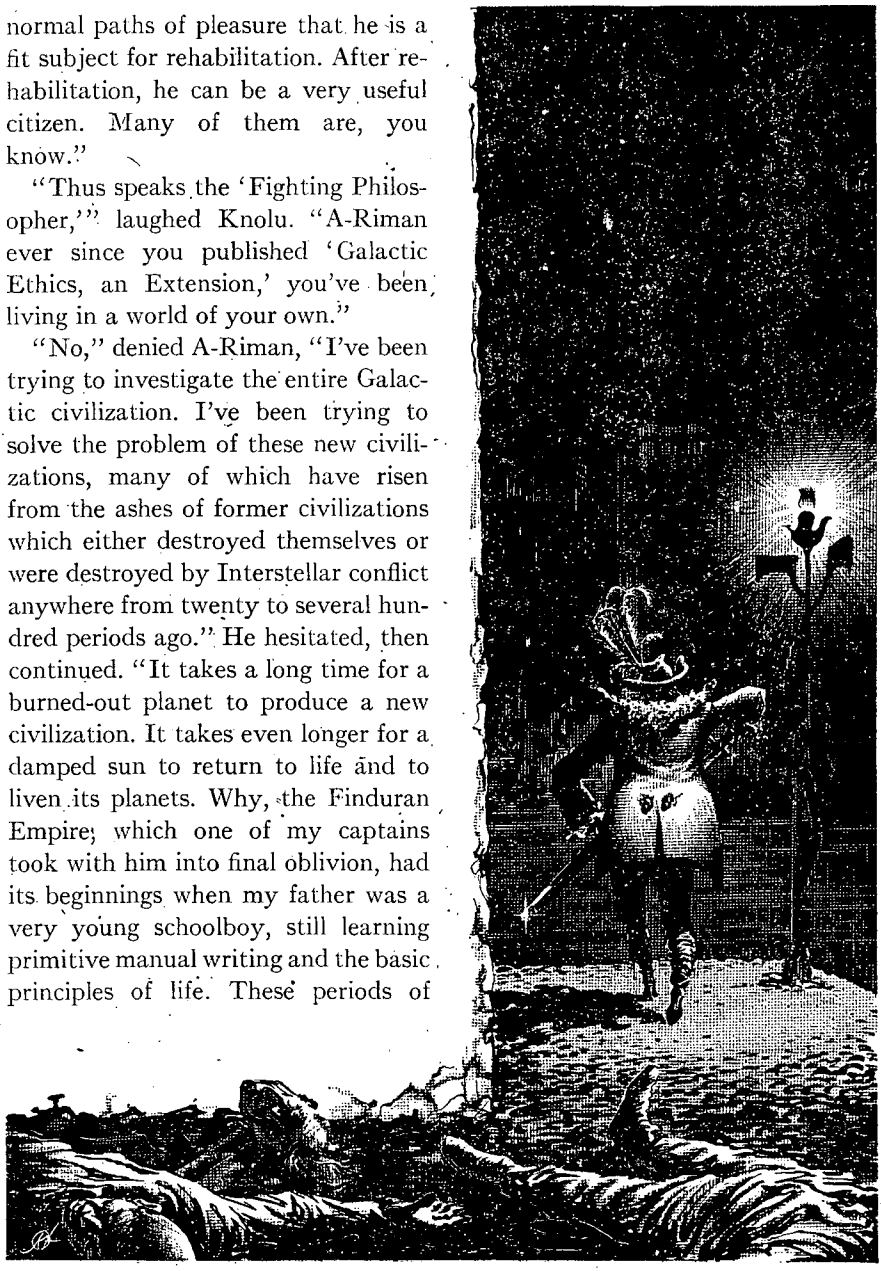
normal paths of pleasure that he is a fit subject for rehabilitation. After rehabilitation, he can be a very useful citizen. Many of them are, you know."

"Thus speaks the 'Fighting Philosopher,'" laughed Knolu. "A-Riman ever since you published 'Galactic Ethics, an Extension,' you've been living in a world of your own."

"No," denied A-Riman, "I've been trying to investigate the entire Galactic civilization. I've been trying to solve the problem of these new civilizations, many of which have risen from the ashes of former civilizations which either destroyed themselves or were destroyed by Interstellar conflict anywhere from twenty to several hundred periods ago." He hesitated, then continued. "It takes a long time for a burned-out planet to produce a new civilization. It takes even longer for a damped sun to return to life and to liven its planets. Why, the Finduran Empire, which one of my captains took with him into final oblivion, had its beginnings when my father was a very young schoolboy, still learning primitive manual writing and the basic principles of life. These periods of



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progress, of learning, of life, should not be merely thrown away. They should be conserved."

"How?" Bolsein leaned forward.

"For short times, say ten cycles or so, I can order my CAC agents in to work on primitive worlds. Of course, I must then grant them long leaves, but during those small spaces of time, I plan to prove that an impetus can be given to a primitive civilization, which will cause it to conform to the Galactic Ethic, and will pre-dispose it to desire membership in the Galactic Federation when it becomes aware of the existence of such a body. If this works out, I feel sure that we can find recruits who will be willing to spend even longer stretches of time as educators and guides.

"I may even be able to train certain primitives and enlist their aid on their native planets. If a group of Drones can find amusement on a primitive world, surely productive personnel can stand considerable tours of duty, and can so guide primitive civilizations from their infant, barbaric beginnings that very few if any new civilizations, upon bursting into space, will have a desire to form great empires of their own. They will be willing and even glad to exchange technologies and ideas with the rest of the galaxy, and will become useful and honored members of the Federation."

"So, what do we do?" queried Knolu.

"Easy. I've got five pickups on file. The chief wants 'em cleared immediately if not sooner. I gather he expects me to take a couple of cycles to clean up things. Let me have full co-operation, and then we can go to work."

Bolsein shook his head. "I never thought I'd see the day I'd be following CAC orders," he complained. "What do you want? Do you need both fleets, or will a few hundred scouts satisfy you?"

Unquestionably, Besiro was the most beautiful capital on all the planet. Here was gathered all the talent, all the beauty, all the wit, and most of the wealth of the civilized world. Here, also, were gathered the most clever, the most experienced, the most depraved thieves and criminals of the planet. After dark, the Elegants of the Court, the wealthy idlers, and the solid merchants of the city, took care to have a trusted bodyguard when they ventured abroad. It was strange, then, that on this night, there was a lone pedestrian in the narrow side street which led to the Guest House of the Three Kings.

The man was dressed expensively and well. His ornate, feathered hat was cocked at exactly the fashionable angle, the foam of lace at his shoulders jutted up and out precisely the correct distance, and the jeweled buckles of his shoes and his coat buttons reflected the glow of the occasional street taper like miniature suns. He strode casually along the street, glancing incuriously

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at the shuttered windows of the houses along the way. Finally, he approached the entrance to an alley. Momentarily, he paused, tilting his head in a listening attitude, then he smiled to himself and continued. He brushed a hand lightly against his belt, then took the hilt of his sword in a firm grasp.

In the alley, "Sailor" Klur was giving his last minute instructions in a low tone.

"Now, One-eye," he said, "soon's he heaves into sight, you dive for his feet. Me'n the Slogger'll finish him off before he gets up." As the footsteps approached, Klur gave One-eye a slight shove.

"Now," he whispered. One-eye dove for the glittering shoe buckles.

At the slight commotion, the pedestrian stopped abruptly, then danced back half a pace. One-eye never realized he had failed in his assignment, for the long, sharp sword in the elegantly ringed hand severed his head before he had time to hit the stones of the street. Klur's intended victim turned smoothly, meeting the sailor's rush with a well-directed point. Klur dropped his long knife, looked for a moment at the foppish figure before him, then collapsed silently to the pavement. The victor advanced, forcing "Slogger" Marl against the wall, the point of his sword making a dent in the man's clothing. Marl sobbed in terror.

"Please, my master, please, they made me do it. I'm a peace-loving man. I wouldn't do nothing. On my honor, I wouldn't."

The man with the sword smiled engagingly. "I can see that," he agreed. "Drop your club, my man."

The club clattered to the alley.

"Now," said the Elegant, "I'm minded to let you go, for you're such a poor thing beside those two valiants who lie there." He dropped the sword point slightly. "Be off," he ordered. With a gasp of surprised relief, Marl turned to make his way to safer parts.

The sword licked out suddenly, and Marl's sudden protesting cry of surprise and pain became a mere gurgle as the flowing blood stopped his voice.

The killer stepped toward the body, glanced disdainfully at its clothing, and shook his head.

"Filthy," he murmured. He walked out to the street, examining the other two. Finally, he decided that Klur's coat was comparatively clean. Leaning down, he carefully wiped his sword blade on the skirt of the coat, then restored the weapon to its sheath, carefully adjusted his hat, and sauntered on his way. Manir Kal, master swordsman, had proved his ability again, and to his own critical satisfaction.

The reports were long and detailed. A-Riman checked them over, rapidly at first, then more slowly, gathering each detail. Occasionally, he nodded his head. Some of these agents were good. Others were very good. He touched a button on his desk. Nothing

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happened. He frowned and touched another button. Still, nothing happened.

Indignantly, A-Riman glanced down at the call-board and punched two more buttons in quick succession. His viewscreen remained dark, and he punched the button marked "Conference," then sat back to await developments. A minute passed, then a light blinked on the desk. As A-Riman pressed the button below the light, the door opened to admit a captain, who took two paces forward, halted, came to rigid attention, saluted, and announced himself. "Captain Poltar reporting, sir." He remained at attention.

"Relax, captain," ordered A-Riman. "Why didn't you answer my screen?"

The captain was still at attention. "The previous commander wanted personal contact, sir," he said, then, as the order to relax penetrated, he quickly took a more comfortable pose.

"Open the door again, then take a chair. I think we're going to have company," smiled his superior.

A voice drifted through the open door. "Oh, I suppose he wants someone to check the guards on that suspect planet. As though we haven't—" The voice trailed off, as the speaker realized the group commander's door was open. Two highly embarrassed officers entered, announced themselves, stood at attention, and waited for the thunders of wrath to descend about their ears.

"Sit down, gentlemen," ordered A-Riman mildly. "We'll have more company in a minute."

Three more officers filed into the room, took two paces, saluted, and announced themselves. A-Riman waved a hand. "Relax, gentlemen," he told them. He turned to Captain Poltar. "Are there any more officers present?" he inquired.

Poltar glanced at the others present in the room, then shook his head. "No, sir. The rest are off the base, checking or investigating."

"Good." A-Riman nodded. "When they come in, have them report to me one at a time." He turned to face the entire group. "Gentlemen," he began, "this is my first, and very probably my last, staff meeting." He raised a hand. "No, I don't mean it that way. I plan to be here for a good many cycles, but I'm going to see to it that the 'conference' button gets good and corroded." He turned to Captain Poltar again. "What were you doing when I buzzed you?"

"Working out the deci-cyclic report, sir."

"It took you over a minute to get here," stated the commander.

"Yes, sir."

"It'll take you ten or fifteen minutes to get back on your train of thought and start over where you left off?"

"About that, sir."

"So, you will lose at least a quarter of an hour from your work, plus the

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time we take in this discussion. How long is that?"

"I expect to lose about an hour and a half, sir."

A-Riman glanced about the group. "Anyone here think he'll lose any less than that?" There was silence.

"So," decided the commander, "I push a few buttons and lose nine man-hours of work—more than one day for an officer." He frowned at the row of buttons on his desk. "Mr. Kelnar, you're engineering, I believe. Have these things rewired right away so that when I call someone I am cut into his viewscreen. There'll be no more of this."

An older man, one of the last to report, rose to his feet. "I'm on my way, sir," he announced, and turned to go out of the door.

"Just a minute," ordered A-Riman. "You were in the Combat Arm once. How did you happen to transfer out?"

"Crash landed in a repair ship on a primitive planet, sir. When they got me patched up, a Board decided I was unfit for further combat duty."

"Why didn't you retire?"

"I like it here."

A-Riman waved a dismissal. The senior technician saluted, swung through the door, and was gone. The group commander gazed after him thoughtfully, then returned his attention to the five remaining officers.

"Maybe, gentlemen, we're not wasting so much time, at that," he remarked softly. "Maybe I'd better go into my philosophy of operation. I just came from the Combat Arm, gentlemen. No one forced me into this job—I came here because I was something like Mr. Kelnar. I like it here. From now on, we're going to work. There'll be very little time for two-stepping, reporting, and so on. We've got a job to do, and we're going to concentrate on it. When I call one of you, I expect an immediate answer by viviscreen, or I expect someone in your office to locate you within a very short time. Then, you will call me. If you have any problems, I expect a prompt call. I'll probably be out of my office. I may be at the other end of the sector, but there'll be someone here that'll know how to get in touch with me."

He picked up the tiny recordings of the pickup data. "We have five pick-ups on Drones who have violated quarantine of Planet Five, Sun Gorgon Three, number four five seven six, Sector Ten. They are still at large and presumably still on the planet. What's wrong?"

"We have guards staked out all around the Sun's system, waiting for them to move, sir. So far, they haven't attempted to leave." Captain Poltar looked a little surprised.

"You're sure they are on the planet?"

"Yes, sir, definitely. We tracked them in shortly after they made planetfall. Since then, not a dust mote

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could've gotten out. Our people are keeping constant watch on their actions."

"What's your disposition?"

"It's in the report, sir," said another officer. "We have ten two-man scouts englobing the planet, at close range, with detectors full out. If they even move, we know it."

"That's twenty men on full-time duty, just watching a mouse hole," commented A-Riman. "Why not simply send in five of the scouts, hunt up your people on the planet, and bring them back here?"

Captain Poltar looked shocked. "Regulations, sir," he exclaimed.

"Which regulations?"

"Why, I believe it's SGR 344–53–4, sir. I'll have it checked if you wish."

"Don't bother." A-Riman smiled at him wryly. "I checked. It says, 'Excepting in cases of extreme emergency, no Guard Unit will make planetfall on any primitive world without prior clearance from higher authority.' Have you checked with the sector chief for permission to make planetfall?"

"I haven't, sir. Commander Redendale said 'Higher Authority' in this case meant the council, and he wasn't about to contact the council to cover my people's incompetence. He said they should certainly be able to do a simple thing like bringing the quarry into the open."

The commander grinned. "He told you, of course, how that was to be done?"

"No, sir."

"And they sent that guy to Combat," mused A-Riman silently, shaking his head. He punched a sequence of buttons on his desk.

The viewscreen lit up, showing a blue haze, then cleared as an alert face appeared, and a voice said crisply, "Admiral's office, Orderly here."

"CAC group commander here," he was told. "Let me talk to the admiral."

"Yes, sir." The orderly reached forward and his image was abruptly blanked out. A few seconds later, Sector Chief Dal-Kun's heavy face appeared. "Yes, commander, what is it?"

"Sir, I would like permission to land ten of my people on a primitive planet."

"Why?"

"I have five pickup orders, sir. The subjects have been located, and I'd like to land agents to bring them in."

"When were they located?"

"Half a cycle ago, sir."

The sector commander's face whitened slightly, then its normal silvery gray became suffused with a pale bluish tint. "Why," he demanded angrily, "wasn't I contacted for this permission half a cycle ago?"

"I don't know of my own knowledge, admiral," replied A-Riman softly.

"Find out, commander. Call me back with the answer within an hour." The sector chief leaned forward. "Go in and get those Drones—now. I want a report on their apprehension within

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ten days." The screen became blank.

A-Riman looked up. "Gentlemen, you heard the conversation, so now you know where 'Higher Authority' may be found. The admiral said ten days. I know that doesn't leave much time to comb an entire planet and locate five men," he paused, looking about the group, "but I'm going to make it stiffer. If our people are any good at all, they'll have kept some track of our subjects. I want to see those Drones tomorrow, right after lunch—alive."

The five officers looked at each other. Then, they looked at their new group commander. "Tomorrow, sir?" said one, "Right after lunch?"

A-Riman nodded. "Alive," he emphasized. "I don't care how you do it. If you wish, and if ten men can, you may turn the planet inside out, but bring them in. We'll pick up the pieces and clean up the mess later. Now, let's get at it. You go to work while I explain to the admiral why this wasn't reported to him long ago." He touched the buttons again. "This meeting's adjourned."

Master Search Technician Kembar looked sourly at the communicator.

"Half a cycle, I'm hanging around this planet, watching a bunch of monkeys swagger around. They won't let me touch 'em. I can't just go in, fiddle around for a couple of days, then pick them up. No—I sit here, rigging gadgets to let me watch 'em." He turned to his companion, who merely grinned.

"Go ahead. Grin, you prehistoric Dawn-man. It ain't funny."

Scout Pilot First Class Dayne stretched his long arms. "So, now they tell you to go in. What's wrong with that?"

Kembar wagged his head. "Half a cycle, that's what's wrong. Then, they tell me to bring 'em in for lunch tomorrow." He glanced over the pilot's shoulder at the clock. "Well, set her down just outside of the city, and we'll get on with it. Tell the rest of the section to meet us in that park just outside of town."

Dayne nodded and turned to his controls. "They've got the old style Mohrkan body shields, haven't they?" he asked over his shoulder.

"Yeah," replied Kembar. He opened a locker, pulling out equipment and clothing. "Set up your hideaway projector now."

The Guest House of the Three Kings wasn't a very elaborate place, nor was it in the best section of Besiro. It had become the haunt of some of the capital's Elegants due to some chance whim of one of the leaders of fashion, and an astute proprietor had held this favor by quickly hiring excellent help, and stocking the best wines, while still retaining the casual atmosphere of a small, slightly down-at-the-heels public drinking place.

In the guest room, long wooden benches lined the walls. Before these

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were the scrubbed wooden tables. The center of the room was normally kept clear, so that the waiters could move more quickly to their customers. Sometimes, the customers used this open area for swordplay, but this was discouraged. Master Korno didn't like bloodstains marring the scrubbed whiteness of his floors.

Outside the Guest Room, in the large hall, Manir Kal met his friends. Balc was teasing one of the waitresses, while Kem-dor looked on with mild amusement.

"Where's Bintar?" queried Kal.

Kem-dor gestured. "Kitchen," he said. "He wanted the roast done just so."

Balc gave the waitress a slight shove. "I'm getting tired of this place," he remarked. "Getting to be a routine. How about finding something else?"

Kal shook his head. "Have to wait a while," he explained. "Malon says they're still watching. Better not move till they give up." He frowned a little, looking at the bare hallway.

Kem-dor nodded. "I suppose you're right," he agreed, "but there must be something better than these silly gambling games. I'm just turning into a money-making machine, and it's beginning to bore me."

"Try their business houses," suggested Balc. "Might be some interest there."

Kem-dor snorted. "Tried that long ago," he complained. "At first, their elementary tricks were amusing, but —" He waved a jeweled hand.

"I know what you mean," said Kal. "The bravos don't put up much of a fight, either." He started for a door. "Well, let's go in and get a drink, anyway."

As he entered the Guest Room, Manir Kal started for the usual table over in the far corner. There was a large man sitting on the bench. Kal looked him over casually. He was a tall, lean individual—well enough dressed, but not in the precise height of style. Probably some rustic landowner in for the carnival, decided Kal. He walked over.

"Sorry, fellow," he remarked. "You're in my place."

The man looked up, but made no effort to move. "Plenty more tables," he remarked. "I've been here for quite a while." He gestured at the table next to his. "Here, try this spot."

Kal smiled inwardly. Perhaps this one would provide some sport. "Possibly you didn't understand me," he said evenly. "You are sitting in the place I am accustomed to occupy. I'll thank you to move immediately."

The other picked up his glass and took a casual drink. "As I said," he remarked, setting the glass down again, "I've been here quite a while. I like it here." He looked Manir Kal over carefully. "Surely, you can get used to another table."

Someone at another table laughed.

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Manir Kal's face flushed. He swept a hand past his belt, then picked up the stranger's glass and dashed it at the man's face.

The rustic vaulted over the table so rapidly he seemed to float. A hard fist struck Manir Kal in the nose, then, as he staggered back, a backhanded cuff sent him reeling against a table. For an instant, rage flooded through him. He snatched his sword out.

"I'll cut you to ribbons for this," he snarled.

The stranger had a sword, too. "Come and try," he invited.

Korno interposed his fat body between the two disputants. "Now, gentlemen," he protested, "there's a—"

Impatiently, Kal poked him with his sword. "Out of the way, fool," he growled, "before we use your body for a fencing mat."

With a shriek, Korno leaped out of the center of the room, then stood and rubbed his injured posterior as he watched the fight.

The blades slithered against each other as the duelists felt each other out, then Kal tried a quick thrust. It was parried, and the riposte nearly threw Kal out of balance. He felt a surge of enthusiasm. At least, this one could fight. He wove a bewildering net of thrusts and counterthrusts, then moved in with his favorite trick, a disarm he had learned long ago.

Somehow, it didn't work. He found his blade borne down to the floor. Quickly, he swung it up again, closing in to avoid a thrust.

"Have to do better than that," laughed the stranger in Kal's native language. "Much better."

Manir Kal started to answer, then the significance of the sudden language change struck him. "You're—"

With an easy shove, the stranger pushed Kal back, then, beating his blade aside, pierced the swordsman's shoulder with a straight thrust.

"That's right," he admitted, "I am."

"Hey," protested someone. "The Old Man said to bring 'em in alive."

"I know," replied Kal's assailant, sheathing his sword, "but he didn't say anything about cuts and bruises."

For a moment, Manir Kal stood, looking at this man who had so easily brushed aside his swordsmanship, then a haze closed in on him and he slipped to the floor. His three companions started for the door, but were met by several grim looking individuals with small objects in their hands—familiar objects.

"Screens down," ordered one of these. As the three hesitated in bewilderment, he added, "Don't tempt us, children."

The large duelist hoisted Manir Kal to his shoulder and started for the door.

"All right, fellows," he said, "let's go." Then, he caught sight of Korno. "Oh, yes," he remarked. "We're taking this man to a doctor. His friends are going along with us."

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A-Riman sat back in his chair. For the moment, his work was done and nothing remained outside of purely routine matters, which he had no intention of considering. He yawned, then glanced at his watch. It was just about time for someone to come up with a report on those five Drones. He smiled to himself.

"Wonder what action they've taken so far?" he asked himself. He leaned forward and touched a button. An enlisted man's face showed in the screen for an instant, then blanked out, and Captain Poltar appeared.

"Yes, sir."

"How about those five pickups?"

The captain glanced down at his desk. "They're being interrogated right now, sir," he explained. "We planned to bring them to you after lunch as you ordered."

A-Riman raised his eyebrows. "Who brought them in, and when?"

"Lieutenant Norkal's patrol was on duty, sir. Sergeant Kembar took his section in and made the pickup. He came in early this morning."

"Very good," nodded the commander. "I like operations that come off ahead of schedule." He glanced at his watch again. "I think I can wait a

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little before lunch. Have the sergeant bring them here." He shut off the screen and sat back, waiting.

The door light flashed, and as A-Riman touched the button, Sergeant Kembar walked in and saluted. He was in a fresh uniform, his insignia gleaming like a new rainbow against the blackness of his clothing. He stepped to the side of the door and drew his sidearm.

"Send 'em in, corporal," he instructed.

Five slightly disheveled individuals filed in, followed by a pair of neatly uniformed guards, who quickly herded them into a line facing the group commander.

A-Riman looked over the tableau, then laughed. "Fine, useful bunch of citizens," he remarked amusedly. "We have here a real credit to the Galactic Civilization."

Sergeant Kembar looked over the prisoners. "Things like these will happen, sir," he commented expressionlessly.

The group commander's amusement evaporated. "Unfortunately, sergeant," he replied, "they do." He pointed at Manir Kal, who stood facing him defiantly. The former swordsman of Besiro had a fresh bandage on his shoulder. His arm was carried in a sling, but he attempted to carry himself with something of his former swagger.

"What's this one good for?"

Sergeant Kembar smiled slightly. "It picks fights," he stated.

"Has it found anyone it can lick yet?"

The sergeant's smile broadened. "With the help of a body shield, it can conquer almost any primitive swordsman," he answered. "Of course, its knowledge of fighting arts is limited, but it knows which end of the sword is sharp—now." The sergeant glanced pointedly at the bandage.

Manir Kal looked angrily over at the sergeant, started to speak, then looked at his feet.

"Well," prompted A-Riman.

"He had a body shield, too," stated Kal.

A-Riman looked at the sergeant, who grinned. "Naturally, sir. Mine wasn't neutralized, either, but the subject found that out after it got pinked, fainted, and came to on the scout ship. It couldn't direct its blade close enough to me to find my shield during the little tussle." He examined his knuckles reflectively. "It leads with its nose, too," he added.

Manir Kal was stung. "I'm a Galactic Citizen," he stated angrily. "I object to being referred to as an 'it'!"

Dalhos A-Riman looked at him sternly. "You gave up your citizenship when you made planetfall on a primitive world," he commented coldly. "Now, you're simply a subject for rehabilitation. You are regarded as being of insufficient competence to speak for yourself." He waved a hand at

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Balc. "This one?"

The sergeant made a grimace of disgust. "It runs after females," he growled. He looked down the line of prisoners. "This one eats," he added, pointing. "This one, with the aid of a calculator, can solve elementary permutations and possibilities. It fancies itself as a gambler." The sergeant paused, then pointed again. "Here is the talented one. It can actually land a pleasure cruiser without having a wreck."

Malon looked at him sneeringly. "I managed to evade you," he pointed out.

The sergeant was unperturbed. "The subject ship headed in for planetfall after giving a false course plan," he said. "We could have blasted, but we were ordered not to destroy unless necessary. We have had all five of these subjects under close observation ever since their landing."

A-Riman nodded. "These are typical Drones?" he asked.

"Yes, sir. Some of them engage in other forms of amusement, some show a little more imagination, but these five are typical."

"I see." A-Riman stood up. "Take these things out, tag them, and ship them to Rehabilitation. In the future, simply pick up any criminal Drones, ship them to Aldebaran Base with suitable tags, and make out a report. I've seen enough of them." He started for the door. "I'm going to lunch now, sergeant," he added. "Be ready to report to me with your section when I return."

The sector chief was half way through his lunch when A-Riman walked into the dining room. With a quick, "By your leave, sir," the group commander slid into a chair and consulted the menu. As he dialed his choice, Dal-Kun cleared his throat.

"Hate to spoil your appetite, commander," he said, "but what's being done about those five Drones?"

A-Riman glanced at his watch. "They should be about ready for shipment to Aldebaran by now, sir," he reported. "The reports are being prepared for submission to your office."

Dal-Kun speared a morsel of food. "Very good, commander," he started. "I'm—" Then, he looked up. "You picked 'em up in less than one day?" he roared. "What's been happening for the last half cycle?"

A-Riman shook his head. "I reported the situation to you, sir. The scouts were forbidden to make planetfall until yesterday afternoon. They had their subjects under extremely close observation and were able to bring them immediately they were granted permission to act."

"I suppose they made a mess on the planet. How long will it take you to clean up and prevent a stir for the planetary historians to pick over?"

"The pickup created very little disturbance," A-Riman frowned thoughtfully, "but I'm not sure yet about the

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effects of the Drones' stay. It may take as much as two tenths of a cycle for complete cover-up."

Bolsein and Knolu looked up as the sector chief planted both hands on the table.

"Commander," he demanded, "are you giving me a story?" He looked at his subordinate sharply. "Commander Redendale always insisted that it frequently took cycles to cover up a planetary landing by Guard Units."

A-Riman nodded his head. "Sometimes it does," he admitted. "I'd rather not comment on the commander, sir. I inherited some very good people from him." He touched the side of his face. "So good," he added, "that they went into this planet without more than ten people seeing them. They staged a minor barroom brawl, picked up their subjects, and were gone without any contact with the planetary authorities.

"I have ordered the sergeant in charge of the section to report to me this afternoon," he added. "I believe he and his entire section are due for a commendation on the operation. When I get through congratulating them, I'm going to order them back to clear up the rather unsavory mess our subjects left for them."

Dal-Kun grunted. "You didn't inherit anything from Redendale but trouble," he announced. "Those people of yours either just came in from other sectors or were trained by previous commanders." The admiral glanced down at his plates distastefully, then punched a button for their removal.

"Redendale was here for less than a cycle," he continued. "I had him transferred because I wasn't sure he was the man for the job. Now, I'm almost sorry I didn't hold him for a Board." He leaned back, folding his arms.

"I believe, commander, that you said something about some experiments you wanted to make. As long as you can keep up with your routine like this, and you don't break any regulations, go ahead. Do you need any clearances?"

"Yes, sir," A-Riman told him. "I need planetfall clearance and at least a three-cycle occupation clearance for personnel on a primitive planet."

"For what reason?"

"General rehabilitation, sir. The civilization I have in mind is still in its infancy. Observer reports say that it is not a particularly desirable civilization, and I'd like to try a rehabilitation program.

"I feel that this civilization will either destroy itself in the near future, or force us to destroy it within five periods. I feel that, with proper supervision, it can be rebuilt into a useful, law-abiding culture, and one which will be a valuable addition to the Federation." He placed his hand on the table. "I feel we can do this without changing the basic characteristics of the civilization in question, and I feel that it is our Ethical duty to do so."

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Dal-Kun looked at him thoughtfully. "I've read your 'Fighting Philosophy,'" he admitted, "but this is something new, isn't it?" He drummed on the table, then looked down the table. "Where are you going to get the personnel?"

"I can use existing CAC personnel for the first few cycles, sir, and possibly borrow a few men from the Fleets. After that, if the experiment shows promise, I will request additional agents."

"Do you think Operations will hold still for a further personnel requisition? You're a little fat right now."

"I know that, sir, but I hope to be able to show the desirability of my experiment before the ten-cycle survey. I should be able to establish a trend in eight cycles at the most."

"It'll be intensive work." The sector chief shook his head slowly, "About four thousand days to make noticeable changes in a planetary civilization which is at least that many cycles old." He looked at A-Riman searchingly. "Wonder if your people can swing it." Slowly, he nodded his head, then brought a hand down on the table. "Go ahead, commander. Try it. If you can show me convincing trends within six cycles, I'll keep the survey people off your back for another ten and let you build a case." He looked at the three officers for a moment, then abruptly got up and left the room.

Veldon Bolsein exhaled explosively. "Brother," he said, "what a bill of goods." He looked at A-Riman, smiling crookedly. "You better make good, Old Philosopher. If you muff this one, your name's not even 'Space Dust.'"

Knolu grinned. "The man's right," he announced. "Slip up, and the Old Man'll feed you to the matter converter in tiny chunks, then he'll resynthesize you to make a new pair of shoes."

A-Riman nodded. "I know," he told them. "I came here to try this, though, and I'm going to do it." He eyed the other two seriously for a moment. "If I mess this up," he added, "the Old Man'll have to do some delicate filtering to find enough of me to feed the converter with." He started for the door.

"See you," he called back. "I've got me a job of work to do."

Quel-tze, high priest of Gundar, Lord of the Sky, stood at the altar atop the temple of Dolezin. He looked skyward, estimating the time needed for Gundar to mount to his zenith, for it was nearly time for the sacrifice. The bright sun shone out of a cloudless sky on the spectacle. The large altar of white, polished stone reflected the light dazzingly, causing the underpriest to avert their eyes from its surface. The shadow of the ring atop the pinnacle of the temple slowly approached the altar.

Quel-tze glanced about him at his priests, making a last minute check to

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see that all was in order. The five were at their proper stations, their regalia in proper order, reflecting the light of Gundar with the proper glory. One of them held the large golden bowl, another, the long sacrificial knife. The others were properly placed to strap the sacrifice into position with a minimum of lost motion. The high priest looked out over the city, where a sea of upturned faces greeted him. Good enough—all the populace were present.

The shadow started to mount the altar and Quel-tze made a sign behind his back, reaching for the knife with his other hand. A sonorous chant started from the level below and before the altar. The walls of this level, cut into a reflector, projected the chant out over the waiting people, and prevented more than a low murmur to reach the priests of the altar. The hymn to the Sun flooded the city of Dolezin to the exclusion of other sounds.

From the shadowed doorway behind the altar, two powerfully built priests came, holding the arms of a feebly protesting girl. Two more priests followed them. As she looked at the waiting altar, the girl's eyes widened, and her mouth opened.

"Silence, my child," instructed Quel-tze. "You are being honored beyond all other women of the city."

"I don't want to be honored," sobbed the girl. "I want to go home."

The high priest smiled thinly. "That cannot be, my daughter," he said.

He nodded to two priests behind the girl, who quickly removed the ceremonial kilt and the heavy breastplates and collar which she wore. They laid these aside and, grasping her ankles, they assisted the two who held her arms as they laid her quickly on the altar. The priests waiting at the altar quickly adjusted the straps to wrists and ankles so that the girl lay helpless on the altar, facing the sky and Gundar. She closed her eyes against the glare and screamed.

Below, the chanting voices harmonized with the scream, the basses weaving a slow, rhythmic pattern with the high, terrorized ululations.

The shadow of the great ring crept slowly along the girl's body, the brilliant disk of light within it approaching the breast.

Quel-tze raised both hands and gazed upward in a gesture of supplication. Below, the chorus chanted, "Grant, O Great Gundar, that our crops be fertile, that our ventures be successful."

The disk of light crept to the breasts. Quel-tze brought the knife down in a swift arc, ending at the center of the disk. Then, he made a rapid incision, the blade making a tearing noise as it progressed. The body of the girl twitched, then lay quietly. Now, the chant softened, and was still.

Reaching down, Quel-tze grasped the still feebly pulsing heart of the Harvest Maiden, cut it free with a few

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skillful slashes of the knife, and held it aloft for a moment before he handed it to one of the attendant priests. He held his hands up once more.

"The Harvest Maiden has gone to the realm of the Lord of the Sky," he declaimed. "Her pure spirit will assure us of plenty in the year to come."

A sigh arose from the onlookers below. Slowly, they started to disperse to their homes. On the outskirts of the crowd, an elderly man slowly led his obviously heartbroken wife away.

Quel-tze turned and made his way down the stairs to his apartment. As usual, he felt tired—emotionally spent—after the exhilaration of the sacrificial moment. This girl had been of striking beauty, he realized, but there were plenty of these.

He made a gesture of dismissal to his attendant priests and entered his rooms. He closed the door and took a few steps toward his sleeping room.

"Well," commented a voice, "our boy's come to us, all in one piece."

Quel-tze turned to the door, but a man stood before it. He was a large man, dressed in unrelieved black, from which blazed small insignia. In his hand, he held a small instrument. Somehow, the manner in which he held this unfamiliar object made Quel-tze realize that here was a weapon which could easily prevent any effort of his to approach its holder. He turned again.

Now, where before there had been merely a vacant space, stood another man. This one was dressed in the ceremonial robes of the high priest of Gundar—Quel-tze's robes. He, also, held one of the small objects.

"They can't talk to you here," this man explained, "so I'm going to stand in for you while you become educated and instructed in your duties."

It seemed to Quel-tze that the object in the pseudo high priest's hand glowed for an instant. Then, all became dark.

Slowly, consciousness returned to Quel-tze. First, he was aware of the sounds of conversation about him, then of light, then of the straps which held him in his chair. Angrily, he strained at these bonds.

"You'll suffer for this," he threatened. "When I am missed—"

He was interrupted. A man in black uniform came into his field of vision. "Afraid you're wrong, baby," he said. "First, you won't be missed. Second, your world is far behind us." He stepped aside, waving to a screen, which lit up, showing small points of light in a black void. "That little one over there," he explained, pointing, "is your 'Lord of the Sky.'"

He turned again, smiling at Quel-tze. "Third," he added, "your re-education is about to begin." Again, he gestured to the screen.

"Many thousands of cycles ago," said a calm voice, "suns shone on their planets much as they do now. The planets were hardly more than cinders,

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but on scores of them were the faint stirrings of life."

Quel-tze felt a strong mental compulsion which forced him to look at the screen closely, to become part of it, to take up every bit of the offered information and absorb it into his awareness.

On the screen, the field of view narrowed, to show a single sun, with its planets, then one planet gradually filled the screen, its surface details becoming plain to see.

The lesson continued step by step. Quel-tze saw the beginnings of life. He saw the rising of life forms, then the beginnings of civilization. He was fed. He slept. The lessons continued.

Civilizations rose and flourished. Some declined and fell. The voice pointed out the reasons for their successes and their failures. As Quel-tze watched, a civilization reached peaks of technical and mechanical ability almost beyond his comprehension. The people of the planet traveled into space, reached for the stars, then, turning again to their old, internecine struggles, destroyed the results of centuries of slow development in a few short, blazing weeks. A few dazed survivors sadly picked over the wreckage of their once powerful, luxurious world. Their descendants reverted to savagery, then slowly began the laborious climb to civilization. Quel-tze shuddered—tried to shut the images from his mind—but always at the threshold of his consciousness was the almost inaudible, but powerful command: "Learn, for only by learning will you survive."

On the screen, the civilization was rebuilding, its development accelerating as it progressed. Again, this planet reached to space—successfully, this time. Other solar systems were reached. Interstellar conquest began, and Quel-tze watched the building of an interstellar empire. He also saw destruction, as civilizations crumbled to ruins, then to complete obliteration before the weapons of implacable conquerors.

The tone of the instruction changed. Before, the emphasis had been on the technologies of the subject civilizations. This second phase of his instruction was focused upon the growth of custom, of ethics, and of law. Again, the civilizations were on the march, their legal, ethical, and religious structures laid bare for observation. Cultures were traced, their oscillations—from high, super morality to definite immorality, to high morality again—becoming obvious under the quiet analysis of the teacher. Some of these systems of life led to decline and fall, others to sudden, blazing extinction. Several of them were successful, and were still extant in the galaxy. The basic framework of the Galactic Federation was exposed, and Quel-tze saw how multitudes of worlds, inhabited by varying peoples of widely varying origins, differing physical shapes, bodily chemistry, and mentalities could live in harmony and com-

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plete tolerance.

On one world, he saw a quiet, pastoral people, tending to their own business. Here was civilization which was fully cognizant of the high technology surrounding it, but which preferred to pursue its own quiet ways of life. Quel-tze came to the realization that in the eyes of the rest of the Federation, this technically undeveloped civilization was recognized as an equal. In the council, delegates from this world were received with respect when they voiced their opinions. Further, it was pointed out, the people of this world were by no means all indigenous. Numbers of them were natives of worlds far removed in space, and of totally differing original cultural pattern. Quel-tze also noted that in several cases, the ships flitting about in space actually formed cultures of their own. There were Federation members who rarely set foot upon any planet, and then not for long. Yet, these wanderers, too, were regarded as equals. They had their voice in the council, and contributed to the welfare and development of the Galactic Civilization in their own way.

The screen cleared. Again, dead plants circled a brilliant sun. Life stirred. Life forms grew and developed. One of these became predominant and formed a civilization, which slowly grew, rose, and flourished in its way. Quel-tze stirred uneasily. This was a familiar pattern. He examined the ethical structure, realizing that it was very familiar indeed. A religion came into power, superseding the power of state and of the people. The Sun became the "Lord of all Creation." Ceremonies were instituted, and the priesthood of the Sun gradually took over the reins of actual power, though none outside the temple realized what was actually happening. Quel-tze shook his head. He had seen similar patterns in previously analyzed civilizations, and the result had been invariable—decline, failure, fall or destruction.

Quel-tze squirmed in his chair as the account went on. A minor government official was proving to be unexpectedly and annoyingly honest. Despite veiled warnings from visiting priests and from some of his own associates, he refused steadfastly to condone and allow certain lucrative practices. Finally, the Temple acted. The daughter of the annoying officer was chosen for the annual sacrifice.

As the ceremony went on, the analytic voice detailed motives, reasons, probably consequences. Other, similar situations were recalled. Quel-tze shuddered, and as the climax of the ceremony occurred, he strained at his bonds for a moment, then collapsed in the chair.

Two men hurried to his side. One applied a small instrument to his throat, listened for a moment, then nodded.

"Close, sergeant," he remarked, "but he's still with us."

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He made an injection in the high priest's arm and stood back.

Again, consciousness slowly returned to Quel-tze. This time, the room was silent. For a moment, madness crept into his eyes, then, he sat back quietly and waited for the screen to light up again. Nothing happened.

"You may continue with my education, gentlemen," remarked Quel-tze calmly. "I am ready again."

The black uniformed psychologist came into his field of vision. He looked closely at the captive, then smiled at him. Bending over him, he loosened the confining straps.

"I think you are, Quel-tze," he answered. "Would you like to meet your fellow-students?"

Quel-tze nodded wordlessly, then stood, flexing his muscles. He looked about the room for a moment, then followed the two guardsmen into the

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next compartment, where several people waited. One man came forward as the priest entered.

"Quel-tze," he said, holding out his hand. "A few days ago I hated you, but now, I think I can work with you."

Quel-tze raised his own hand. For a moment, the two men stood, hands on each other's shoulders. "I'm sorry, Tal-Quor," said the priest.

"I was at fault, too," the other admitted. "Had it been someone else's daughter, I would have remained undisturbed."

A trill of silvery laughter sounded through the room. "It was all an illusion," announced a girlish voice. "This year, the Harvest Maiden was a large swamp lizard."

Someone called "Attention." Sector Chief Dal-Kun walked to the front of the room, looked at the twenty officers, then nodded.

"At ease, gentlemen," he ordered. "We seldom have a full staff meeting here, but Commander A-Riman has a report which should be of interest to all of us. I would like to have comments when it is completed. Commander A-Riman."

The CAC Commander faced the group. "As many of you gentlemen know," he began, "CAC has been engaged in an experiment for the past five cycles. The Criminal Apprehension personnel, as well as many of the Combat personnel, have become extremely interested in this experiment, and most of them have worked much more than normal time on it. With the co-operation of the sector comptroller"—A-Riman nodded to an elderly officer—"we have written off a good deal of our time to training. We think this time has not been wasted. I believe you gentlemen will agree after reviewing this report." A-Riman bowed slightly and took a seat.

The lights dimmed and the viewscreen lit up. A solar system appeared as seen from an approaching ship. One planet crept to the center of the screen and grew larger. The voice of an observer came from the speaker.

"This is the seventh planet of Sun Frank Three, number six two nine, Tenth Sector. Life has been in existence here for at least a thousand periods. The age of the present dominant civilization is estimated at seven periods."

The screen closed in, to show details of cities. Conversations between members of the populace were repeated. The thoughts and actions of officials were shown. The growth of cruelty in government, in private life, in the temple, was shown, as was the appearance of immorality and of human sacrifice. Finally, detailed scenes of the Harvest Maiden sacrifice appeared. The voice broke in again.

"As can be seen, this civilization has a high probability of failure. It will stagnate and eventually be eliminated, either by another civilization not yet formed, or by Federation Council orders, if it progresses far

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enough to warrant that attention." There was a pause. The screen showed an overall view of a large city, its buildings gleaming in the sun. "This is the civilization picked for initial experiment," added the voice.

The abduction of Quel-tze and his companions was shown. Scenes of their training appeared in brief flashes, then their return to their own world was shown. The reforms instituted by these people began to appear, one scene showing Quel-tze as he faced six councilors of the Kelmiran Empire. One of them was speaking.

"This tampering with the time-honored ceremonies of our religion will not be tolerated," he announced.

"I thought I was the high priest," objected Quel-tze mildly.

The councilor looked at him scornfully. "You should know, priest, that your temple has always been the creature of the state. We give the orders—you merely furnish the cloak of sanctity."

"This borders upon sacrilege," remarked the priest.

"This is merely practical government," snorted the councilor. "Now, for the last time, will you accept our nomination for the Harvest Maiden?"

Quel-tze smiled gently. "As I said before," he insisted, "the Harvest Ceremony is being changed to conform with the ceremony of many years ago, before the age of cruelty and immorality. The altar has been removed."

The councilor's mouth tightened. "Then, you force us to act," he growled with a gesture of finality. For a moment, he stood looking at the high priest, then he turned. "Guards," he called, "arrest this man for treason."

A group of armed priests stepped into the room. The councilors looked at them in puzzlement.

"These," explained Quel-tze calmly, "are my guards. Yours are in the temple dungeons, where you will soon join them." He looked at the leader of the priestly warriors. "Take them below, Qual-mar. They will await a Temple Trial for sacrilege."

The six councilors blanched. "The emperor—" one of them quavered.

Again, Quel-tze smiled. "The emperor," he told them, "is receiving a priestly delegation. I might add that it is a much more effective delegation than yours. No threats will be made, no violence will be offered, but tomorrow, the emperor will find it expedient to appoint new councilors."

Further scenes showed the operations of the new Imperial Council. The final scene showed the Harvest Maiden, standing proudly atop the temple at Dolezin. She had reason to be proud, for she had been chosen from all the young girls of the city as the most beautiful, the most talented, of all. By her side, stood a prize draft animal, which would be later used in the Imperial stables. In her hands, she held the best of the year's crop. Below her, the priests chanted. It was the same.

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hymn to the Sun, but now it was slightly muted, and the clear, high voice of the Harvest Maiden could be plainly heard, leading the melody. The voice broke in again.

"Probable success is now indicated for this culture. Considerable supervision must be given for at least a period, but it is believed that the civilization will now progress to become a valued member of the Federation."

The lights brightened. Commander A-Riman stood again. "Gentlemen," he said, "this is the report on the first five cycles of this experiment. You have seen most of the steps taken. Of course, we forced this process somewhat to prove our point in a short space of time. I believe further activity of this type should take place at a more leisurely pace, but we think we have shown a desirable result. Are there any comments?"

Geronor Keldon, the sector comptroller, stood. "Gentlemen," he said, "I will admit that I authorized the utilization of Commander A-Riman's personnel on this experiment with some misgivings. Now that I've seen the results, I have no further objections to continuation."

Several other officers added their remarks. Most of them were laudatory. A few expressed regret that they had not been involved in the operation. Finally, Dal-Kun got to his feet.

"Well," he remarked, looking about the room, "it seems that the report has met with general favor. I would like formal reports of your reactions, and any suggestions as to improvement. I feel that this report, with recommendations should be presented to the Federation Council for consideration." Again, he looked about the room. "This meeting is adjourned."

A-Riman switched off the report as the buzzer sounded. The screen lit up and his secretary's face appeared.

"Who is it?" queried the commander.

"Captain Poltar, sir."

"Put him on."

The captain's face was slightly amused as he appeared on the screen. "The new personnel just came in, sir," he announced. "Do you want to see them now?"

A-Riman dropped the report recordings into their cases. "Send them in," he instructed. "How do they look to you?"

"Pretty good, sir." Again, the expression of secret amusement crossed the captain's face. It annoyed A-Riman slightly.

"What's so funny, captain," he demanded.

"Nothing important, sir. I'll send in the first one now."

"Bring him in personally," growled his superior. "Then, we'll both be able to enjoy the joke." He switched off and waited. There must be something very strange about this new batch of personnel to make Poltar laugh. A-

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Riman couldn't remember too many times that officer had even smiled.

He pressed the admittance button at the signal, and the captain walked in. "Here's the first one, sir," he said, stepping aside.

A guardsman entered. He held his head directly to the front, paying no attention to the furnishings of the office. Pacing off the prescribed two paces with mathematical precision, he halted and came to a rigid salute. A-Riman's practiced eyes took in the man's entire appearance at a glance. He was freshly uniformed. No spot of light reflected from the absolute, dead blackness of his clothing, excepting where the iridescent glow of the torches at his collar picked up the light and broke it into a blazing spectrum.

"Junior Search Technician Manir Kal reporting for duty, sir," the man reported. He dropped his hand sharply, standing at perfect attention.

"At ease, guardsman," said A-Riman. "Haven't I seen you before?"

"Yes, sir," the man replied. "I've been here before."

"I remember," commented the group commander dryly. He fixed Captain Poltar with a mildly scornful look. "It's happened before," he remarked. "What's funny?"

"There's more to it, sir," grinned Poltar. He moved to the door and beckoned. Another guardsman entered and stood at salute.

"Junior Psychologist Barc Kor Delthos reporting for duty, sir."

"Well, well," commented A-Riman. "Any more?"

"Three more, sir," said Poltar. "A physicist, a trend analyst, and a pilot."

A-Riman's face broke into a grin, then he sat back and laughed. "All right," he admitted. "You've scored. Bring 'em in and send for Sergeant Kembar."

Three more men filed in, reported, and stepped to the side. A-Riman looked at them severely. "Now," he inquired, "just who dreamed up this idea?"

Manir Kal raised a hand. "I'm afraid I did, sir," he admitted. "Of course, Senior Rehabilitation Technician Kwybold had something to do with it, too."

A-Riman nodded. "I thought I recognized his delicate touch," he commented. "How was rehabilitation?"

Manir Kal grimaced. "I spent a good share of it in the hospital, sir." He rubbed his chest reflectively. "I can name at least twenty guardsmen who can beat me at swordplay. They all tried it." He paused for a moment. "I learned plenty, though," he added. "I've an idea I could give Sergeant Kembar a hard time now."

"Want the opportunity?" A-Riman smiled at him.

Manir Kal shook his head. "Thank you, sir, no," he said decidedly. "Next time I unsheath a sword, it'll be in line of duty. It's part of my business now, and I'm not giving out any free

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samples of my swordsmanship."

Sergeant Kembar came into the office. A-Riman caught him on the first pace. "At ease, sergeant." He waved a hand. "Here are five more men for you."

"Thank you, sir. I'm a little short-handed right now." Kembar looked toward the five guardsmen. "I'll get their—" He looked again, then stared directly at Manir Kal. "I've met you before," he stated positively. Then, he looked at the others.

"This one picks fights," stated Manir Kal expressionlessly.

"It runs after females," announced Barc.

"I'm the talented one," boasted Malon.

Kembar placed his hands on his hips, and shook his head helplessly. "All right," he chuckled, "so I know Rehabilitation, too. How do you think a lot of us got into this business?"

A-Riman coughed. "I've got news for you, sergeant," he said.

Master Search Technician Kembar snapped to attention. "Yes, sir."

"I know Mr. Kwybold, too," A-Riman told him. "A few thousand cycles ago, I led a revolution against the Federation Council."

Kilar Mar-Li arose slowly from his chair. As the senior delegate from Celstor, he realized that his word carried weight. He also realized that this report and proposal was from a compatriot and protégé of his. He thought, however, that the report still warranted comment.

"Fellow members," he began, "we have just seen an interim report, and heard a proposal." He noticed smiles on the faces of several members and decided against too dignified an approach. He smiled, too. "Terrible introduction, I'll admit," he added, "but the fact remains that for the past four Galactic Standard Hours, we've been watching a report from Sector Ten. A new experiment has been tried, and I think it's worth following up. I would like to move that the council issue special authorization to Commander A-Riman to continue his operations."

A delegate from the comparatively new Paldorian Empire arose. "I would like to propose an amendment," he said, "to the effect that a motion be entered for the consideration of the delegate from the seventh planet, Sun Frank Three, number six two nine, Tenth Sector, for the establishment of a new corps in the Stellar Guard, this corps to be devoted to the education and, where necessary, the rehabilitation, of new cultures over the entire galaxy."

The chairman laughed. "I might remind the delegate," he commented, "that it may be a couple of thousand Standard Cycles before that still unborn gentleman takes his seat."

Mar-Li arose again. "I accept the amendment," he remarked, "The Federation has waited for more than a

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thousand periods for this experiment to begin. We can wait for two or three more periods to see its results. I predict that many of us here will be present to welcome the new delegate to his seat."

Marzold Quonzar, first delegate to the Federation Council from the newly admitted Gundarian Association, blinked his eyes as the lights came on.

"So that's the true story," he mused. For a few minutes he sat thinking, then he called his secretary.

"Write a motion for consideration of the Federation Council. Title it 'A proposal for the formation of a new corps in the Stellar Guard.' You can word most of it, of course." He paused. "Let me see," he reflected. "That Commander was nicknamed 'The Fighting Philosopher.'" He nodded his head. "We will recommend as a name for this new organization, 'The Philosophical Corps.'"

THE END

THE ANALYTICAL LABORATORY

The letters and cards rating the stories still are using the 1 to 10 rating system to some degree; I appreciate it, even though I can't use that system in the point-score for the Lab. One difficulty with any all-time-rating system must be recognized: While it helps me to see how you compare the yarns this month with the yarns of the last four or five months, I wouldn't trust it much beyond that. Any organism, to live, must grow and adapt — must change, in other words. Of all possible magazine audiences, the science-fiction readership is most subject to that process of change called "learning." Your tastes change, your development causes a differing reaction to a given stimulus.

Any long-time basis of rating something as highly frontier-boarder type in interest as is science-fiction would, I suspect, be self-defeating. I'm in the spot of trying to figure out what *will* please you; the one thing I'm sure will *not* please you is that which you have already experienced and been pleased by! This business of getting useful meaning out of story ratings is a highly interesting problem; the authors and I alike are trying to guesstimate what you *will* like. Like any really good problem, it's a headache, a challenge, and fun.

But please let us know what did please you, so we can see how good our predictions are!

January 1954 issue:

Place	*Story*	*Author*	*Points*
1.	EXILE	Everett B. Cole	1.75
2.	THE RETURN	H. Beam Piper and John J. McGuire	2.30
3.	BERTHA	Ralph Williams	2.50
4.	A.I.D.	Algis Budrys	3.47
5.	THE LONELY MAN	Frank M. Robinson	4.36

THE EDITOR.

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MARSHMALLOW WORLD

BY JOSEPH WHITEHILL

In a dictatorship, *there can be only one Strong Man. It might be difficult to handle a really strong man, though . . .*

Illustrated by van Dongen

The Lord Director ate lunch at his desk that day. His secretary was so shocked at this irregularity she had to make him repeat his order before she got it straight. "Kanga sandwich, Persian figs and milk," she said looking at him intently. She said it the same way she would have said, "You need a long rest, my lord." The Lord Director would have agreed with her.

After she had gone out to give the order to the chef, the Lord Director moved stiffly to the sweeping panawindows and stood before them with his hands clasped in his armpits.

From here, high in the giant white cube of the South American Directorate; he could overlook nearly a hundred square miles of Good Things. Close by, one of the new crawlers was pulling an eighteen gang disk harrow. It would do an entire section of land in a day. Farther away, in a parklike grove of elms was the crawler's parent farm cell, where the young workers lived. Straight green roads led all the way to the far horizon. Here was an implement factory, there a grain elevator. Everywhere was peace, industry and order.

Everywhere except here in the Lord Director's office.

Here there was Fear. Hundreds of years ago, before the Reorganization and Sanity Return, fear was the daily companion of everyone. Now it was unknown. One of the charges of the Directors over the world was to keep it so. And for a Lord Director himself to be afraid—this was the ultimate

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failure of his charge.

With the common gesture of bald men, he rubbed back his scalp and turned again to his desk. There, on its smooth top lay the authors of his somber mood. In themselves the articles told no story. There was a single-sheet memo with a short, typed paragraph. And there was a group of misshapen lumps of metal, glass, and plastic; perhaps six of them. Nothing more.

But looking at them and beyond them, the Lord Director saw his Good Things hesitate and fall. He was the only man who could prevent this.

And he didn't know how.

He wanted to tell somebody about it. There was nobody to tell. No one could help him out of this one. A Lord Director was a lonely man. He sighed and picked up the sheet of paper.

The interdepartment memo had been given priority placement by his secretary. It had been the top paper in the box marked "TODAY" when he arrived that morning. It read:

January 46, 2207

AA Classification

To: The Lord Director, Research and Production Center, South America

From: Section Leader Breuer, Electronics, Propagation Division, Telemetering Group, Peak Pulse Modulation Section, Development.

File Copy To: No file copy has been made.

Rating: Double Top Secret—Double Top Silent.

Authority: None. The usual chain of command was circumvented here.

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It is believed by the writer that a discovery of utmost importance to the Lord Director was made by myself yesterday in my lab. An immediate audience is requested with the Lord Director. No Attendants or Telerecorders must be used.

Signed: V. E. Breuer—372-010-Eldev

The Lord Director's heart had quickened a little as he reached for the combox. This one really must be *something*. For a mere section leader to drop his guard like that was unheard of. Even for unwarranted use of the AA Classification a man was always derated.

"Miss Quinn!"

"Yes, sir." Her face appeared in the box.

"Get hold of Section Leader Breuer in Electronics and have him come up here right away."

"He's waiting out here now. I told him you'd—"

"Send him in in three minutes."

"Yes, my lord." Miss Quinn looked dismayed.

The Lord Director strode deliberately around the large room, keeping his eyes always fastened on a vase of snapdragons on a side table. One green shoot of the flower arrangement kept pointing at him wherever he went. He got up on a chair and then got down and lay on the floor. The shoot raised and dipped to follow him. The telerecorder was tracking properly.

The Lord Director was back at his desk with his hands clasped before him when Section Leader Breuer was shown in. The Lord Director was a little disappointed. A man carrying such a big thing in his head should look a little more imposing. Breuer was still in his lab smock, and carried a brief case before him with both hands. He looked tired. He was a thin middle-age man with sparse light hair and bifocals.

The Lord Director stood up and they shook hands. "Sit there," he said kindly.

"Thank you, my lord." The section leader sat straight in his chair with the brief case on his knees.

"You're Breuer, I believe. Before we get into this thing of yours, I feel I should remind you that the penalties for misuse of channels are very serious. You already have laid yourself open to about nine counts of edict subversion. What I'm trying to say is this: If you want to reconsider, I'm sure we can be very easy with you even now."

"You mean I should go away and write a report on this?"

The Lord Director thought Breuer's smile a little smug. "You can if you want," he said shortly.

"Believe me, sir, if this thing could wait, that's what I'd rather do. But it can't. It absolutely can't, that's all."

The Lord Director watched the other man closely. A real cool one. Doesn't take bluffing at all. "Very

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well, then, Mr. Breuer. Please go ahead."

"It's difficult to tell exactly where to start." Breuer's eyes searched the desk, seemingly hunting for words. He picked up a glass ball and weighed it in one hand. "Do you have any great attachment for this paperweight?"

"What?" The Lord Director thought he had misheard the man.

"I mean, would you object to my conducting a sort of destructive test on it?"

"How? Here? Right in this room?"

"Yes. I think if I demonstrate for you first, it will be easier to explain in words after."

The Lord Director's hand moved toward the firing bar of the hidden gun that was covering Breuer. If the man was mad, so be it. The Lord Director was prepared. Breuer watched the motion of the hand, but gave no sign that he understood its meaning.

"Go ahead," said the Lord Director, his hand poised.

"I chose this object because it is one with which you are familiar. I could not have doctored it in any way, right?"

"I don't see how."

"Here. Look at it again." The Lord Director did as he was told. It looked normal as far as he could tell. It was one of those solid glass balls with a glass flower inside that were made by the Decorator Guilds in large quantities.

"Now, watch closely," said Breuer. He closed his hands over it, keeping his eyes on the Lord Director's face. Then he squeezed. *The glass squirted from between his fingers like clear putty.* He laid the deformed lump on the blotter before the Lord Director.

"Was that sleight of hand?"

"No. I am manually clumsier than most people."

The Lord Director picked up the piece of squashed glass and examined it closely. There were even fingerprints and casts of the lines of Breuer's palm molded into it. He looked at the smiling man across the desk and said slowly, "That would have taken at least fifty thousand psi in a press."

"About forty."

"All right, forty. Do some more."

Breuer opened his brief case and withdrew several pieces of machine bar stock—steel, aluminum, Naval bronze, and nylon. As he put them one by one on the desk before the Lord Director, he said in a quiet voice, "Previous to doing any more, I think you should give some thought to disconnecting the combox. Why don't you let me unplug it?" The Lord Director chewed his knuckle and nodded.

With the plug dangling in his hand, Breuer said, "I do not know whether the telerecorder is on, but I suspect it is. If it is, you have only a few minutes left to erase what it has seen before Security editors get a look at it. With all respect, my lord, I think this thing should be just between us, at least for

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now." Then he sat down.

Knowing that turning off the tele-recorder also turned off the tracking and firing mechanism of the stun gun, the Lord Director hesitated, then pressed the Erase-Off bar on the little console beside him. There was simply no alternative.

"Thank you," said Breuer. Easily and in rapid succession, he took up the pieces of material from the desk and worked them in his hands. Of the steel he made a rough ball; from the aluminum came a crude ashtray; the bronze in a moment was a creditable Dutch pretzel. Breuer reached in the pocket of his smock and brought out a ball bearing the size of a walnut. Holding it between thumb and forefinger, he lowered it out of sight behind his chair and turned his head away. "This is made of Duralite. Tensile is around two hundred eighty thousand. Listen." It went off like a firecracker. Pieces of it tinkled all over the room. Breuer got up from his chair, picked out one of the imbedded fragments from it, and gave it to the Lord Director.

The Lord Director looked at it without seeing it. You just don't break Duralite. The only way you can machine it is by diamond grinding.

"Here's the last of the demonstration," said Breuer. He was over by the wall safe. He reached up and pinched the knob off, mashed his way through the heavy door plates, reached inside through the hole and brought out a microreel, all with the air of a man who has just caught a trout.

"Stop! Stop!" The Lord Director came out of his chair and rounded the desk at a trot. He took Breuer's hands in his and turned them this way and that. He felt the pulse. He pinched the meat. He articulated the fingers. Just plain hands. Ordinary hands. No tricks.

The Lord Director was aghast.

"All right, now," he said weakly, "tell me as much of this as I can understand." He sat back in his chair to listen.

"I work in the telemetering section," Breuer began. "We concentrate mostly on the problems of transmitting remote metered data about the weather and sea conditions. The source points where the information is gathered are generally islands at sea; uninhabited and otherwise useless islands. The installation equipment has to be fully automatic and as trouble-free as we can build it, so the maintenance flights can be kept at a minimum. We use dense cathode tubes and deposited resistors and low-level germanium triodes, and all that sort of thing.

"The worst sort of trouble we have is with power supplies. Energy sources, I really mean. We're using wind generators and wave-action generators, but they're mechanical. The best kind of generator would be one with no moving parts whatever. Even a breeder reactor has moving parts. And it requires human supervision to keep it

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from stopping or running away.

"Everybody at the lab agreed that a solar converter would be the ideal answer. Sort of a thermocouple idea but on a power scale. But the best one we could build gave us about four kilowatts per acre area in the cell. Therefore, instead of trying to get more power from the converter, we elected to use less in the transmitter. The way to use less in the transmitter is by peak-pulse transmission. Is that at all familiar?"

"Somewhat," said the Lord Director. His mind kept wandering back to that ball of Duralite.

"Well, in essence, it's this: Let's say you need a kilowatt of power to do something, for instance, to override ambient noise energy at the receiver. But you only have a hundred watts to do it with. You use time as a variable. You make yourself a box with some things inside, and you feed in your hundred watts continuous at one end, and out of the other end come one-kilowatt pulses whose duration is one tenth of the interval between pulses. That's what I was working on when this thing happened. Right now I don't even think I could duplicate the conditions."

The Lord Director raised his eyebrows at this. "What happened?"

Breuer frowned. "I'm not just sure. I was using a mercury bath for the transmitter tube coolant. I dropped a gold collector ring into the mercury by accident, and I went in after it with both hands. I think I felt a little jolt when my fingers touched the ring. I didn't think any more about it for a couple of hours, but later on, when I was trying to start the cap screws that hold the head on the magnetron, I squashed one of the screwheads flat between my fingers. It felt just like a marshmallow. I tried the others then. They felt regular until I put too much pressure on them. Then they went all mushy."

"What you're saying is you have a peak energy converter in your hands, is that it?" The Lord Director was trying to keep this thing in the realm of the knowable, and felt he was failing.

"You might say my hands *are* peak energy converters."

"Yes." The Lord Director paused a moment. "Tell me, Breuer, just exactly why did you bring this to me?"

Breuer was a long time answering. He took off his glasses, toyed with them, and put them back on. He said in a low voice, "You mean you don't think this is that important?"

"Of course it's important. You'll probably be upgraded six ranks for the discovery. But other discoveries were important, too. Things like Controlled Rate Photosynthesis and Color Conversion of Transmitted Light. All these were important in their way, but all of them came up through accepted channels, too."

"I'm sorry, my lord. I suppose I was carried away. The physiology of the

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process is out of my field. I thought it was something new and different." Breuer scratched his chin. "Just think, sir. A man won't need pliers and screwdrivers and wrenches any more. The only thing that could be better than man's prehensile forepaw would be that same forepaw with unlimited power."

Unlimited power for what? thought the Lord Director. *For the creation of chaos?* "Suppose we do this," he said aloud. "As soon as you have cleaned up your work on the peak-pulse transmitter, and get one installed and operating, we'll create a special section for you. We'll give you biologists and metabologists and whoever else you need. Then you can tear into this idea full tilt and really explore it. How does that sound?" The Lord Director was temporizing as best he could on such short notice.

"All right, sir. Should I sort of keep it under cover?"

"*Absolutely!* We can't have a premature announcement, you know."

When Miss Quinn brought in his lunch, the Lord Director was still standing by the panawindow. While she was gone, the crawler had disked more than thirty acres. "Just put it there on the desk. And thanks."

"Yes, my lord." On her way out she plugged his combox back in the wall.

What do you do with a man?

You encourage him.

What do you do with a baby?

You teach it.

What do you do when the baby has a weapon?

You take it away.

And if the weapon is a part of the baby, what then?

You isolate the baby from others.

Do you still teach it?

Yes.

How?

You teleteach it.

Can a baby swim in marshmallow syrup?

No.

Thank you very much.

At two o'clock that afternoon communications began radiating from the Lord Director's office high in the great white cube of the Center. The machinery began to move.

* * *

On a gaunt and rocky island two hundred miles off the coast of Peru District there is a weather station powered by a solar converter. The man who installed the converter often goes down to the wild shore to watch the surf come foaming in. He idly molds toy boats out of the stones he finds around him. He hopes some day to make a bigger boat.

Big enough to carry a man.

THE END

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RITE OF PASSAGE

BY CHAD OLIVER

Illustrated by Doore

***Everybody** knows what civilization means . . . in their own terms. But try and spot the other fellow's civilization when he's using quite other terms.*

I.

The ship was named the *Juarez*.

Outside, all was well. A tiny white bubble of flame played about the stern jets and the *Juarez*, one hundred light-years distant from the planet Earth, picked its graceful way through the system of Carinae.

Inside, it was different. The *Juarez* was a death ship. Someone, somehow, on one of the outer planets, had taken a chance with a germ. Perhaps he had been in a hurry, perhaps he had forgotten, perhaps it was just one of those things.

It didn't really matter now.

The *Juarez* carried a crew of fifty-four. Six were still alive. Of the remaining six, three were clearly dying.

It was a long way home.

Martin Ashley wiped the cold sweat from the palms of his hands. He handed the doctor a glass of water. "Here you go, Doc," he said quietly.

Doc Slonsky managed to control his trembling long enough to hurl the water against the wall in a gesture of supreme contempt. "A dying man asks for a drink," he said acidly, "and you bring him water. I have told you, Martin—there is no time for jokes. Not any more." The trembling stopped and beads of colorless sweat popped out on his forehead. "Get me a drink."

Martin Ashley walked shakily across the dimly-lit room, picked his way between two silent, sheet-covered figures, and retrieved a half-empty bottle of bourbon from a table. It couldn't do any harm now, he knew. When they reached that stage, nothing made any difference. He went back to the doctor, poured out a glassful, and handed it to him. Slonsky downed it at one prodigious draft, shuddered from a new

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cause, and managed to prop himself up on one elbow.

"Bourbon," the little man said unhappily, "you'd give a dying man *bourbon*."

"You're not dying, Doc," Martin told him, stuffing a pillow behind him for support. "You're indestructible."

"Garbage," the doctor said, dropping the glass on the floor and taking the bottle instead. "Many men have been indestructible—Caesar, Hannibal, Bluebeard. Where are they today? Dead, all dead." He took a long pull from the bottle.

"You'll pull through, Doc," Martin lied. "You're not the same as the others, you don't have quite the same thing, you see, and—"

"Martin."

The room was very quiet around them. *No one talks in a graveyard*, Martin thought coldly. *No one but the caretaker.*

Slonsky let his head fall back and Martin took the bottle out of his limp hand. Slonsky closed his eyes as though the effort of keeping them open was too much for him. "Martin," he said again, his voice very weak.

"Yes, Doc."

"Martin, Gallen has a prayer to pull through; he passed the crisis hours ago and is still alive. He has a chance. You seem to be immune; it is because you have lived an evil life, although that particular remedy didn't work in my case. The Chavez boy never came down either. That makes three of you, two for sure. You'd better get the rest of us out of the ship, Martin."

"Now, Doc—"

"Give me a drink, Martin."

Martin Ashley put the bottle in Slonsky's hand, but the hand didn't respond. It was very quiet. Doc Slonsky's eyes opened for the last time, unseeing, and Martin pulled the sheet up to cover his face.

He was alone again.

"Good luck, Doc," he said.

He walked slowly through the silent room, not thinking about anything. He had seen it happen too many times. He was numb. He took a drink out of the bottle himself, being long past the stage where sanitary precautions concerned him. If he didn't have it now, he wasn't going to get it, and maybe that was too bad. The bourbon burned a little in his stomach but failed to warm him. He set the bottle down on a convenient table and left it there.

He stepped out into the corridor and closed the door behind him. He stood for a long minute, listening to the faint throbbing hum of the mindless atomics, and then he began to walk down the empty corridor, not sure where he was going, or why.

As he had so many times before when he was confused, or just lonesome, he wound up with Carol. He had carried her to her room a long time ago, when there still had been hope, and he went there now, needing a word, a look, anything.

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He didn't get it.

Her blond hair was lifeless on the pillow, and one slim arm hung down by the side of the bed, rocking slightly with the vibrations of the ship. She had no make-up on, as usual, and her blue eyes were closed. She was still breathing, faintly.

Martin Ashley looked at her for a long time. He remembered. Mostly, he remembered the long talks they had had, and the laughs, while most of the

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Juarez slept around them. Carol had been one of the navigators, and Martin had always thought of her as a potentially beautiful woman. She could have been beautiful, and more than that, but she didn't let herself be. She had lost her man, a long time ago, and Martin had never been able to take his place. He had only kissed her once, and never tried again.

But they had had a closeness between them. They had understood one another, and they needed that. They had cheered each other up when they were low, and when they both felt good they had fun. They had both known that some day—

Well, some day wouldn't come, now. Maybe it never would have anyway, but they had both liked to think that it would.

There wasn't anything he could say to Carol. He left her where she was, because he couldn't watch, and went out again into the empty corridor.

Martin Ashley needed life. He needed to see a living thing, even a dog or a fish or a plant. The *Juarez* was like a tomb. It *was* a tomb.

He walked through the tunnels to the senior's cabin, listening to the click and echo of his heels on the metal floor. Long before he got there, he heard the sobbing that filled the corridor.

That would be Bob Chavez, the senior's son, he knew. Probably, it meant that old Alberto Chavez was dead. He smiled a little, sadly. Al Chavez had only been fifty-five, twenty years older than himself, but that was old for space. He caught himself wishing that Al could have pulled through, instead of his son. He didn't even dislike himself for the thought; he was past caring very much. It wasn't that Bob was no good, of course, but simply that he probably wasn't good enough.

He knocked on the door. "Come on out, Bob," he said.

The sobbing choked off, hurriedly. His knock wasn't answered.

"Come on, Bob," he said tonelessly. "We've got work to do."

The door opened finally. Robert Chavez was twenty-one years old and he was dark and handsome in the classic tradition. His eyes were red now, and Martin reflected idly that this was the first time he had ever seen him without his hair combed.

"Let me alone," the boy said. "Go away."

Martin felt sorry for him, as much as he could feel sorry for anyone today, but it obviously wouldn't do to leave Bob in there alone with his father. "We're all that's left, Bob," he said quietly, "unless you count Gallen. I know how you feel, but that won't help. We've got about twelve hours at the outside to orbit this ship and pick us a planet. I need your help."

"I don't give a damn, Mart," Chavez said. "I just don't give a damn."

He started to close the door, but

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Martin had his foot in it. "It isn't easy to grow up in a hurry," he said, "but you're going to have to do it. I'm going up to the control room, and I'll give you fifteen minutes. You take a look at your father and figure out what you ought to do. I'm shoving off, and whether you come along or not is your business."

He turned and walked away. *It would have to be Bob*, he thought. *It would have to be him; of all people.*

He walked toward the control room, smiling sourly.

Fifty-one down and three to go.

They had set up a cot for Ernest Gallen in the control room, by his radio equipment, just in case. When Martin Ashley came in and sat down next to him, he opened his eyes and managed to hold up two fingers in an ironic V for Victory.

"Man," he said, "I'm still alive. How do you like that?"

"I like it fine, Ernie," Martin said. "How do you feel?"

"Like the worms wouldn't have me. I'm afraid I may live."

"You'd better."

"Who else we got, Mart?"

"The kid. Period."

Gallen sighed. "In that case," he said, "suppose you just pick up a gun and put a bullet through my brain, and I'll toddle along peacefully to the happy hunting ground. No point in prolonging the agony."

Martin Ashley looked at the man on the cot, sizing up what he knew about him. Ernie Gallen was about forty, with a short and stocky build, blondish hair and brown eyes. He was moody, and inclined to be at his most cheerful when the going was the toughest. He was—or had been—the radio expert on the *Juarez*, and in other fields he tended toward the "common sense" approach to problems. He had a sense of humor. Ashley liked the man, which helped. Ernie might be a good man to have along, from a purely objective viewpoint, or he might not.

That would depend on what they ran into.

"Hell of a note," Gallen said, shifting his position on the cot. "Two guys left to run a spaceship in the middle of nowhere—an anthropologist and a radio bug. Add one kid who knows all the answers, and what have you got?"

"Not very much," Martin Ashley admitted. "Not enough, certainly."

The control room was silent around them, except for an occasional click or buzz from automatic equipment. The small noises served as a mechanical counterpoint to the not-sound of emptiness. The great viewer still flashed its images. The computer hummed with readiness. The dials presented their data with complete unconcern, and the lighted control bank was ready to go.

But the ship was dead. The heart and brain and spirit were not working. They were stretched out in rows, with sheets over their faces. They were

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cold. The ship was a corpse—fine on the outside, and all the organs still in place, but incapable of thought or action. It kept going, zombie-fashion, but it was not alive.

And the three who still lived? Martin Ashley smiled. An active thyroid gland—that was the kid. A larynx and a velum—that was Ernie. And himself?

A bit of spinal cord, maybe. And, no doubt, a dash of ego.

It wasn't going to be a very lively corpse.

"What can we do, Mart?"

"The radio is out, I suppose?"

Ernie Gallen shrugged as well as he could from a prone position. "There should be another ship from Earth out this way in another zillion hours or so," he said. "Conceivably, there might be an alien ship along about the same time. Until then, we can chat with the star-static. There's nothing coming in."

Martin Ashley grinned, deliberately keeping his mind from touching again on what had been his friends, stacked in neat white rows through the *Juarez*. His friends and Carol, who had been more than that. "The solution is obvious," he said. "We just sit down and wait for a mutation to turn us into supermen. From that point, presumably, the problem will be duck soup. Neat, eh?"

Ernie Gallen groaned.

"There's only one alternative, really," Ashley said slowly.

"That's one more than is visible from here," Ernie said. "Let's have it."

"Well, let's look at the facts. We're a hundred light-years from home, and the three of us simply do not constitute an adequate crew for the *Juarez*. If three men—even three specialists—could handle this crate, they'd have sent out three men in the first place, and not fifty-four. We may be able to pull off some very simple and elementary type of maneuver at low speed, but trying to operate this monster in overdrive would be suicide, but fast—and no pun intended. You with me so-far?"

"No argument," agreed Gallen. "You spoke of an alternative—?"

"After a fashion. We agree that we can't move this ship out of the Carinae system; O.K. We seem to agree also on the ugly point that there's no practical chance of our being picked up before we're too senile to care. So what's left?"

Gallen essayed another shrug, and Ashley noted with alarm that the strain of talking was already beginning to wear Ernie down. When he spoke of three men, even that was something of an overstatement.

"Here's the way I see it, then," he said slowly. "We can either live out our lives on the *Juarez*, just sitting around staring at each other until we all flip our lids, or we can take the shuttle, pick us a planet, and go down

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and carve some sort of a life out for ourselves—or try to. Here's another little fact for our collection: I figure that if we don't swing the *Juarez* around within the next few hours, we'll be out of the system into deep space—and I don't know whether or not we can get it back again."

Ernie Gallen just looked at him, unspeaking.

"If we can find a planet we can live on—and the survey showed several possibilities in that direction—we can try to orbit the *Juarez* around it, and take the shuttle down. That way, we can always come back if things get too rough. We can rig up a broadcast beam from the ship, telling where we are and who we are, just in case another ship should blunder out this way. That's the only chance I see for us, Ernie. I don't know how you feel, but I've only got one life to live, according to the best information available, and I don't want to live it in this coffin. I want some grass under my feet, and some air over my head. I want a chance to be a human being, and not an animal floating around on a raft after the world's gone bang. Excuse the speech."

The control room was lost in emptiness, with furtive clicks and buzzes chattering in the immensity.

"What's down there, Mart?" Ernest Gallen asked finally.

Martin Ashley shrugged. "Your guess is as good as mine. No broadcast waves coming in that we've been able to pick up, and nothing on the energy detectors. That may mean that there's nothing there, or it may mean there's something around that hasn't reached a Stage Four technology, or it may mean that we'll be up against something so different we'll never understand it or live with it. Pick one."

Gallen smiled weakly. "You're not much of an ad man," he observed.

Martin Ashley waved a hand at the steel hollowness around them. "I know what's *here*," he said quietly, "and that's enough data for me. I'm going. If you think your chances are better on the *Juarez*, you're probably right. But it's not for me, Ernie."

"Not for me either, Mart," Gallen said in a low voice. "You'll have to carry me out, though."

They were silent then, feeling the death all around them in the *Juarez*. The silence was broken with startling abruptness by a furtive sound from the control room door. Martin Ashley felt the hackles on the back of his neck crawl. He turned around, half expecting to see a walking corpse.

Bob Chavez stood in the doorway. His face was very pale, his eyes very bright. He was breathing hard and fast.

"They're all dead," he said in a high, taut voice. "All dead but us. What's going to happen to *us?*"

There was more silence.

"That," Martin Ashley said finally, "is a very good question."

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II.

It was four "days" later.

The shuttle from the *Juarez* blasted uneasily through the emptiness of space toward the blue-green globe that was the fourth planet in the system of Carinae. It was a tiny ship, designed for short ship-to-planet hops, and it was out of its depth now—a slender minnow from sun-drenched shallows, caught in the center of a dark sea, and going down and down and down—

Into what?

Martin Ashley, strapped in next to Ernie Gallen, kept his eyes on Bob Chavez at the controls. He did not look out at the sucking immensity that waited for them outside the plastiglass shield. But he *felt* it—a yellow, burning sun, a million stars, a vastness beyond imagination. It was a measurement of the infinite and it cut man down to size. It was a mirror that reflected back to every man a true and merciless image of himself.

Looking out into space from a small ship was not a popular experience.

"Try the beam, Ernie," he said. "It's too quiet in here, jets or no jets."

Ernie nodded. He was still weak, but he was stronger than he had been, and his brown eyes were clear. "You just like to hear yourself talk, Mart," he said. He cut in the shuttle's radio.

Martin Ashley's voice came in out of space.

It was perma-recorded, coming from the transmitter of the empty *Juarez*. The *Juarez* was orbited about the fourth planet now, traveling in a long, silent circle through the emptiness that had been her home. There was no life on the dark *Juarez*, and the only sound on the ship came from Ashley's steady flow of words into the unknown:

"THIS IS THE *JUAREZ*, SURVEY SHIP FROM EARTH, SEPTEMBER TWENTY, TWO THOUSAND AND SIXTY-SEVEN. UNKNOWN DISEASE HAS KILLED FIFTY-ONE OF CREW OF FIFTY-FOUR. THREE REMAINING MEN HAVE TAKEN SHUTTLE TO FOURTH PLANET, SYSTEM OF CARINAE. CONDITIONS THERE UNKNOWN. WILL MAINTAIN CONTACT WITH SHUTTLE RADIO. SURVIVORS ARE ERNEST GALLEN, RADIOMAN; ROBERT CHAVEZ, APPRENTICE PILOT; MARTIN ASHLEY, ANTHROPOLOGIST. MERRY CHRISTMAS TO ALL AND TO ALL A GOOD NIGHT. THIS IS THE *JUAREZ*, SURVEY SHIP FROM EARTH, SEPTEMBER TWENTY, TWO THOUSAND AND SIXTY-SEVEN. UNKNOWN DISEASE—"

Martin Ashley closed his eyes, remembering.

He remembered ejecting fifty-one bodies into space.

He remembered a nightmare of orbiting the massive *Juarez*.

He remembered Carol.

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He remembered Earth—one hundred light-years away.

"That's enough," he said. "Turn it off."

They were alone again, alone with the muted scream of the jets and the whispers from an endless sea.

Ahead of them, waiting, was Carinae IV. Only a name to them now, a name and a sphere of blue and green—a whole world, utterly unknown.

And three men who would have to call it home.

Bob Chavez, his face set and pale, pulled the shuttle out when they were five miles from the surface. He jockeyed the little ship down gingerly to a self-correcting altitude of one mile. The ship hissed through the atmosphere of Carinae IV, losing speed.

The portable survey equipment from the *Juarez* was in action, but they all looked down.

They saw great wooded tracts, soft brown under the yellow sun. They saw lush green fields, rolling away in search of the horizon. They saw emerald lakes and sparkling streams that spider-webbed across the land.

And then there were blue-black mountain ranges, their peaks dusted with cloud, that the shuttle had to rise over sharply in order to pass. And a gray desert, cut with dry canyons and fluid with driven sand. And a band of thick green—

And then the sea. An enormous sea, translucent green and flecked with white spray from long, chopping waves. A sea that seemed to go on forever, empty except for periodic outcroppings of coral islands, lightly sprinkled with green. A sea that stretched on and on, tossing fitfully, until it lost itself in darkness.

The shuttle flashed on into the night side, its scream shattering the stillness of the deserted air. The three men sat quietly, listening to the portable survey equipment clicking and buzzing as it picked up and integrated data from scanner beams and thermal radiations and movement indices, correlating them into rough ecological frameworks.

Martin Ashley had already seen enough to confirm the preliminary distance survey made by the *Juarez* when they had first entered the Carinae system.

There were no cities, no large concentrations of any sort, on Carinae IV. There was no detectable industry. There was no radio, no power, no technology that could register on the sensitive detectors.

But they had all seen one thing that the distance survey had missed. One thing that made all the difference.

Men.

The planet was occupied.

The shuttle stayed in the air, circling the planet. It whistled into the sunrise and hissed on toward high noon.

Martin Ashley lit up his pipe and

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worked his way through the survey data, adding to it from his own observations and training. His green eyes were bloodshot now, and he was going on sheer nervous energy. He was tired, but there was a question he had to answer. He read the question in the eyes of his two companions:

What kind of a world is it, this new home of ours?

He took a deep breath and clamped his pipe more firmly in his teeth. He looked down at the world slipping by under the shuttle, jungle growth now, and felt vaguely amused at his own presumption in trying to sum up a whole planet in a few well-chosen words. Planets could be tricky enough in themselves, and when they were inhabited by human beings it was a rash observer indeed who would predict dogmatically what they were like.

Human beings had a curious tendency to remain unpredictable, despite all the survey equipment and charts and figures and analyzers. Quite possibly, Martin Ashley had long ago decided, that was why they were human beings.

He took a stab at it, though. That was his job.

"It looks pretty good," he said slowly, "if we handle ourselves right when we land. But I've got to warn you about something, and you'll have to remember it if you want to stay alive down there—all I can tell you about right now is what this planet *looks like on the surface*. You've both kicked around on survey ships long enough to know that surface indications can be *very* misleading. There's an example I want you to paste inside your skull somewhere; imagine yourself to be some alien observer that has come to Earth. Say you land on a beach, and there you see some old joker padding about in his shorts and getting sunburned. Let's say that this old joker is one of the greats, taking a day off. You name him—Aristotle, Shakespeare, Einstein, Retokin. All you see is an old red man in his shorts. Maybe he looks stupid and senile. How are you going to evaluate this man, just by watching him soak up the sun? Your first impression may be very, very wrong—and if you treat our hypothetical bigwig as an ignorant lout, you may very well wake up dead in the morning."

He blew a smoke ring at the shuttle control panel and tried to judge what effect his words were having. Hard to tell. It was so easy to make a false move in a contact situation that sometimes fantastic precautions had to be taken. And if they guessed wrong on Carinae IV, there wouldn't be any *Juarez* to get them out alive.

It was strictly up to them.

"O.K.," he said. "You've been watching too, and I don't know that I can add very much to what you've seen. On the surface, and as far as the survey equipment can analyze, there is nothing technologically complex

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down there. The atmosphere and general planet-type are fine and dandy, of course, or we wouldn't have come here from the *Juarez*. The planet is definitely inhabited, and evidently inhabited by human beings. As far as I can see, the people here are pretty well scattered over the planet—you could see them in the forests and on the plains and even out on those coral islands in that one big ocean. There's one very curious thing, and I don't quite know what to make of it yet; all the people I saw appear to have a relatively uniform material culture. I didn't see a single group practicing really advanced agriculture, but on the other hand I didn't see a single group without cleared crops of some sort. If the data's been analyzed correctly, those crops all seem to be of the same general type, with specialized local varieties for differing environmental conditions. That may be very significant, or it may be just a fluke of planetary ecology—but it's worth bearing in mind. All the groups I saw appear to practice a mixed economy — some agriculture, some hunting and fishing and gathering. The largest group we picked up contained about one hundred individuals —no really large concentrations of population. House types look crude but adequate. No energy weapons at all, so I assume these people utilize either a spear or a bow, depending on how far they've gotten. That's about it, the way I see it. A rather primitive level of cultural development, as far as I can tell from here, and only one puzzling feature—the culture seems amazingly uniform all over the planet. That's really astonishing, considering that they appear to have little or no means of long-distance communication. I can't explain it. Any ideas?"

Ernie Gallen shrugged. "That's not my department, Mart," he said. "Maybe they're all in a rut."

"Telepaths?" suggested Bob Chavez.

Martin Ashley shrugged, puffing on his pipe. "Let's hope not," he said. "Learning a telepathic language is the toughest job there is, especially when *you* don't happen to work that way."

"It does sort of simplify things in a way—the uniform culture, I mean," Gallen suggested. "At least there's no problem of picking the right group to set down in. They're all the same; we can just flip a coin."

"Don't forget Mr. Einstein on the beach," cautioned Ashley. He was genuinely worried, but it would serve no useful purpose to upset the others now. "But Ernie's right—I guess we might as well set her down. The preliminary survey from the *Juarez* showed one other possibility in this system, remember—Carinae V. But I sure don't feel like trying *that* hop in this scooter unless we have to. I vote we go down."

Ernie Gallen nodded. "Same here," he said.

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"I'll make it unanimous then," Bob Chavez agreed. A spark of interest burned in his dark eyes—the first sign of animation he had shown since his father's death. "It's really something, isn't it?" he asked with wonder in his voice. "Just think of all we know, all we've been through, that they haven't even started to think about yet down there! A whole world waiting for us, a whole new world to build up for us—and maybe for our children."

"Lord knows it could use some developing," agreed Ernie Gallen.

Martin Ashley smiled, hiding the sick feeling that turned his stomach to ice. "Beggars can't be too particular," he said. "Take her down, Bob."

The scream of the jets muted into a roaring mutter and the shuttle from the *Juarez* started down.

The shuttle had landed.

They could not, of course, open up the port until the air was carefully analyzed—not for basic constituents, which they already knew were O.K., but for possible disease contamination. Just because *some* human beings could live on Carinae IV didn't mean that *they* could, without long-developed immunities.

The dead *Juarez* was eloquent testimony to this basic fact.

They could see, however, and they could hear. They saw a rich green field of grass all around them, stretching away into the west as far as the eye

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could see, and merging in the east with the soft browns and yellows and greens of a spacious forest. They heard the strange silence of land left alone—a vibrant silence compounded of a myriad of tiny sounds, of wind whispers and furtive chirpings and distant cries of unknown animals.

Carinae IV had a "day" of twenty-two Earth hours, and now the yellow sun was setting on the far horizon, settling gingerly like an elastic ball among the peaks of a blue-black mountain range. Long shadows marched silently through the sea of grass.

The air analyzers hummed gently, and evening came to Carinae IV. Even here, Martin Ashley thought, so far from home, the night still came. How many times had the night fallen on this world, and what dramas of love and hate had played themselves out on the grass fields that swayed unconcernedly around the alien shuttle from Earth? How many times would *he* see the night fall here—and what would the days be like that separated the nights?

This world looked peaceful, contented. A man could do a lot worse, he thought, and *had* done a lot worse. But how could you tell?

A volcano was pleasant enough—until it erupted. And this world was far from Earth, had never even *heard* of Earth.

Its standards would be different.

"Well, we can't go out until morning," Ernie said, sensing the thoughts that were in all their minds. "Let's hit the sack and worry about it when the time comes."

He tested the radio, and the message came in at once: "SHUTTLE TO FOURTH PLANET, SYSTEM OF CARINAE. CONDITIONS THERE UNKNOWN. WILL MAINTAIN CONTACT WITH SHUTTLE RADIO. SURVIVORS ARE ERNEST GALLEN, RADIOMAN; ROBERT CHAVEZ, APPRENTICE PILOT; MARTIN ASHLEY, ANTHROPOLOGIST. MERRY CHRISTMAS TO ALL AND TO ALL—"

He switched it off. "A good night," he finished. "Tell the bugler to take it easy in the morning; I got sensitive ears."

"Good night," said Bob Chavez, lost in thought and awed again at the enormity of the thing that had happened to them.

"Good night," said Martin Ashley. He was very tired and trying not to hope too much. He did not sleep for a long time, listening to the night sounds outside and the rustling of the breeze in the long grass.

He slept, finally, but it was a restless, uneasy sleep—the sleep of a man who knows that he is not alone.

And high overhead, an almost invisible speck of light lost in the silver glow of the solitary moon of Carinae IV, the empty *Juarez* floated in a slow circle among the stars.

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III.

In the morning, the natives were there.

There were three of them, standing patiently in the tall green grass. They were dressed in short, togalike garments that left the arms and legs free. Two of them carried bows, and the third was armed with a metallic club of some sort. They acted neither threateningly nor fearfully.

They simply waited.

Martin Ashley looked them over carefully from the security of the shuttle, taking in the situation with a practiced eye. Bob Chavez was still new to this type of experience, and his pale face was flushed with excitement. Ernie Gallen sized them up without enthusiasm; to him, they looked pretty much like primitive peoples he had seen on any one of a dozen occupied planets.

"Hail, fellow citizens and newfound brothers," Ernie said, determined to make the best of a situation that in no way appealed to him. "We want to be pals, so kindly point them things the other way."

"They don't look so bad, do they, Mart?" Bob asked.

"Not from here," Martin Ashley agreed.

"The view from the inside of a stewpot is less flattering," Ernie Gallen observed. "But this is your department, Mart. What do you make of them?"

Martin Ashley smiled. There were three human beings, standing in the high grass fifty yards from the ship. He had never seen them before and knew practically nothing about them. Human beings were ticklish things to evaluate, even if you knew them well. What did he make of Ernie Gallen and Bob Chavez? He wasn't sure, and they were *inside* the ship.

But never mind all that, doctor. Just give us the capsule diagnosis, and if you're wrong . . . well, better luck next time. If there is a next time.

He said: "There are only three of them, and unless my eyes are getting too old to tell the difference one of them looks like a woman. See—the one with the club or whatever that thing is? I could be mistaken, but they hardly look like a war party. They don't seem angry, and they don't seem afraid. Probably we're something completely outside their experience, but I'm just assuming that. Unfortunately, I'm not Sherlock Holmes. I can't look at the color of the clay on their heels and tell you their philosophy of life. There's only one way to find out, unfortunately."

Ernie Gallen cocked an eyebrow at him.

"I'll just have to go out and see," Martin Ashley said. "The air analyzers say O.K., and we'll have to do it sooner or later."

"I'll go with you," Bob Chavez offered at once.

Ashley warmed a little at that;

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maybe he had misjudged the kid. "Thanks, but that won't do," he said. "You stay here with Ernie and keep me covered. Remember: don't shoot unless I signal I'm in trouble. And if they get me first, just get out of here and try again some place else.

"Good luck," Ernie Gallen said.

Martin Ashley nodded and stepped into the open air lock. He closed the inner door behind him; it wasn't necessary except for the fact that the outer door would not operate with the inner door open. He spun the heavy wheel and the outer door clicked open.

He took a deep breath and stepped out into the morning air.

The tall grass of the field was still wet with dew and the world was still chilled by the night. The sun, climbing rapidly now, was pale and just beginning to feel warm on his back.

He walked steadily, watching the three natives. He felt little emotion now; this was a job he had done many times, on many worlds. He was not visibly armed, but he had a gun inside his shirt. He didn't want to use it, and wouldn't use it if he could help it. But he had used it before, and would again if it were necessary. He smiled wryly.

You didn't have to go to school to learn about survival.

The three natives watched him come, unmoving. As he came closer, he saw that one of them was unmistakably a woman. The natives had an odd pink skin color, almost the shade of salmon, that looked like a perpetual sunburn. They were handsome people, by any standards, and they looked him straight in the eye.

Ashley walked slowly. It was a long fifty yards. He kept his face utterly expressionless. He was very careful not to smile. There were no such things as "universal" gestures. On one planet a smile meant friendship, while on another it might be a bitter insult. Expressionless features were *almost* always a sign of neutrality, since that was the resting position of the face. It was the safest bet there was.

When he was about seven yards from them, Ashley stopped. He did nothing. He simply stood there, his hands empty at his side. He made no sound. He waited for *them* to make the first move.

They eyed him without fear—without even curiosity, as far as he could tell. A long sixty seconds passed. Then one of the men smiled, making Ashley feel a little silly, and put his bow on the ground. The other man promptly followed his example, and the woman put down her metallic club.

Taking no chances, Ashley took out his gun and placed it on the pile with the other weapons. The others smiled approval.

The first man said something to him, speaking slowly and softly. *Testing?* Ashley could not, of course, understand a word. He replied in Eng-

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lish: "I know that we can't understand each other yet, but I hope that understanding may come." He smiled a little and added, "It had *better* come —and soon."

The native appeared satisfied. He pointed toward the east, where the forest trees loomed up like a wall beyond the grass, made the shape of a hut in the air, and then pointed at Ashley. The meaning was clear enough —Ashley was welcome to come to the village if he so desired.

Ashley did some pointing of his own, to indicate that he wanted to go back to the ship first. The natives understood instantly. *They're not stupid,* Ashley thought, *and that's for sure.*

Ashley went back to the shuttle and told Bob and Ernie where he was going. He told them to give him four days and then clear out if he didn't make it back. He shook hands with both of them and rejoined the three natives.

They picked up their weapons and Ashley picked up his, and no one bothered about them again. The first native led the way through the damp grass, with Ashley second and the other man and the woman following behind. The natives talked quietly among themselves and seemed perfectly at ease.

Martin Ashley felt the sun getting hotter on his back and tried to tell himself that the *wrongness* he felt was only nerves.

But he knew better.

Once contact had been made, the rest slipped easily into routine—for a while. Ashley had to constantly remind himself that this time it was *different*. There was no *Juarez* to report back to, no paper to write up about a people whose lives had intersected his for a brief few weeks and then been lost again among the stars.

This time it was for keeps.

This time the people were *his* people.

But routine is an insidious thing; it dulls the mind and lulls the senses with the comfort of the familiar. Martin Ashley liked his work, and did it with pride, but it was hard now to remember that it was more than a job.

It was life itself.

He got to know the village very well during the next month, while he was learning the native language as he had learned so many others in his life. There were sixteen structures in the village—fourteen rectangular log family houses built around a central plaza, a large ceremonial building in the center of the plaza, and a partially underground storage chamber for agricultural produce. Seventy people lived in the village, neatly divided into five old men, five old women, fifty persons in the young-to-middle-aged bracket, and twenty children.

The natives were friendly and helpful, and Ashley had gone back for Chavez and Gallen on the third day. They had built themselves a small log hut on the edge of the village, and

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they spent most of their time wandering around and waiting impatiently for Ashley to tell them what the score was. They both seemed pleased with what they saw, and they both were beginning to think that Ashley was taking everything a shade too seriously. After all, here they were in a peaceful and rather pleasant village, with plenty to eat and time on their hands. Here they were, and here they would probably stay. They had ideas and they wanted to get started on them. They were not selfish men, as men go, but they were human. They felt that they had forgotten more than the people around them had ever learned, and they wanted to help them out. Why, these natives had not even discovered the wheel—and they had landed on the planet with atomic power!

The future was wide open before them.

But they waited.

And while they slept, a puzzled Martin Ashley worked far into the night—juggling columns of figures that wouldn't add up.

The native who taught Ashley the rudiments of the language was named Rondol. He was a specialist in the native social structure, obviously a shaman among other things. Apparently, he had other capabilities as well. He was a brash man, a bit pompous, shrewd, and a good teacher. It early became clear that he was teaching Ashley a simplified form of the language of his people—scaling it down for ready comprehension.

That was unprecedented.

"I will teach you the rest when you are ready for it," Rondol said to him, with a faintly superior air. "To understand, one must start at the beginning."

"Drop dead, brother," Martin Ashley said—to himself. He wasn't getting enough sleep, and he was annoyed at his own inability to comprehend the culture in which he found himself.

On the surface, it wasn't too complicated. The natives called themselves the Nern, which simply meant "human beings." It was quite common for primitive peoples to name themselves in that manner, and the implication was usually obvious—no one else could be a human being, since they were not in the tribe.

It was not, Ashley reflected, a characteristic wholly restricted to primitives.

The Nern, as Ashley had already seen from the shuttle, had a simple mixed economy. They grew a single crop, a sweet tuber not unlike a potato, which they planted with digging sticks and harvested when their supply ran low. They shot several game animals with bows, mostly deerlike creatures that grazed on the great grass plains. They did some fishing in nearby streams, and they gathered a variety of fruits and vegetables that grew wild in the forest.

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The Nern were monogamous, and lived in small family units. But they were very conscious of kinship ties, and the little village was divided into halves, or moieties. Each moiety was a unit in the social organization, and they worked together as a reciprocal whole. Marriage always took place between members of opposite moieties.

Nothing unusual there.

There were no clans, although the moieties had some clan characteristics. Sexes, as far as Ashley could tell, had equal rights. There was a "chief" of sorts, a charming man named Catan, but such authority as there was seemed vested in a council of elders—the ten oldest men and women. There was one shaman, Rondol, who was primarily concerned with healing and the supernatural.

Nothing unusual there.

There seemed to be a great emphasis on mythology, or even philosophy. There were many rituals, in which the whole village participated. There was the yearly cycle of ceremonies, a virtual universal among human beings. Some called them Christmas and Armistice Day and the Fourth of July, others rain dances and harvest sings and sacrifices to the sun.

Nothing unusual there.

One night, Rondol stood with Ashley in the central plaza. A cool breeze whispered in off the grass fields and sighed through the forest trees. A few orange fires crackled and hissed softly in front of the log huts of the village.

Rondol pointed up into the night, out into the infinite. "You say you came from the stars, Martin," he said.

"Yes," said Ashley. "From the stars, from Earth."

Rondol smiled. "What you call stars we call campfires in the sky," he said. "Up there are our ancestors and the never-born. The stars are our brothers." He looked closely at Ashley. "We call them our star-brothers. Are not the stars our brothers?"

The wind murmured in from the fields of grass.

Nothing unusual there?

Martin Ashley looked up, and out.

When they had been in the village two months, they were asked to leave.

For a long time, the social life of the Nern had been "pointing" toward a single event—the initiation of two boys and two girls into adult life. As did many other peoples, the Nern symbolized crisis periods in life with rituals and ceremonies. These were the rites of passage—passage into life when you were born, passage into adulthood when childhood was done, passage into marriage, and the final passage of all when life had run its course.

Now, four Nern were ready to take their place in adult society. It would take them four days of fasting and endurance and instruction from the tribal elders. It was a precious thing in their lives.

And outsiders might offend the gods.

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The Nern were very polite about it. They went out of their way to assure the men from Earth that they would be welcome again after the ceremonies. They were profuse and sincere in their apologies.

But there was no doubt that they meant business.

Ashley and Gallen and Chavez went back to the shuttle, silent and alone among the tall grass. There was nothing else they could do.

They waited.

On the fourth night, the last night of the ceremonies, they crept back through the grass to the forest to have a look. They moved quietly and spoke in whispers.

A drum throbbed hypnotically through the evening hush, and they could see the orange warmth of the fires in the village. A chant sobbed out on the moonlight, plaintive and sad and far away. The forest held its breath, absorbing the sounds of life.

Martin Ashley was lonely. He had always been a lonely man. He questioned instead of accepted, and that is a road that all men walk alone. Perhaps all men are lonely, and Ashley hid it as well as any. But Ashley was acutely aware of his loneliness, and now that Carol was gone, and with her the *Juarez* that had been his only home—

He shook himself. *Getting morbid*, he thought. *Mustn't do.*

But he was looking in at life, warm life in a village one hundred light-years from Earth. And he was isolated, cut off from it. He didn't *belong*. Perhaps he could never belong.

He knew, and he was not ashamed, that he would have given his soul to be in that village now, in with the drums and the songs and the firelight.

Not as a student. Just as Martin Ashley.

"They're a funny bunch," Ernie Gallen said. "Beating on those drums just like it was really something. Boy, we really picked us a dilly for home sweet home."

Bob Chavez was feeling romantic. "It's pretty, really," he said. "Kind of simple and unspoiled. But what's in it for us? We've got to show these people we mean something, got to show them a few things, carve out a place for ourselves. We're being too careful. After all—"

Yes, thought Martin Ashley. *After all, after all.*

It was then that he found it.

He picked it up off the ground.

He looked at it. A white tube, four inches long. Machine-made. While he held it between his thumb and forefinger it glowed redly at its tip. A tiny wisp of smoke curled upward into the night.

"A cigarette," he said slowly. "And better than any on Earth."

The others stared at him.

"Looks like we're not the only visitors this planet has had lately," he said. "Unless—"

"Unless what?" asked Ernie Gallen.

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"Unless *what?*"

Martin Ashley stood in the moonlight under the trees. "I don't know," he said. "I just don't know."

He listened to the lonely chant carried on the night wind and watched the orange fires glowing from far away.

Martin Ashley felt a dawning fear—and a rising excitement.

IV.

It was raining—a slow, steady rain that pattered through the trees, dripping from limb to limb, and gurgled down in a miniature river from the gabled roof of the log house.

Martin Ashley stood in the doorway, looking out. The rain was a humming sheet of silver and gray, covering the world but not hiding it. The tall, straight trees accepted the rain patiently, without much interest. The trees were very much like Earthly pines, with dripping needles and cones. They even smelled like pines, with that wet heavy fragrance that could weave synthetic memories for those unfortunates who had none of their own. Glistening village pathways wandered off among the houses, and laughing children played in the mud. The washed air was so clean it invigorated the lungs like a tonic.

Perhaps this, too, is worth something.

Martin Ashley liked the rain.

They had been with the Nern for ten weeks. Bob Chavez sat on a wooden stool in the middle of the room, quiet and depressed. Ernie Gallen, short and stocky and with his blondish hair in his eyes, paced the floor nervously. They were beginning to feel it now, Ashley knew. The isolation, the Earth forever denied them. It wasn't an unreal picnic any longer. They felt cut off from everything that had ever mattered to them. From copters in the sun, silken women, dark hushed bars with music in the air—

The rain came down—soft, familiar rain. It was the same rain. Ashley had heard it so often—how many times? He had sworn at it while he fished, damned it at Yankee Stadium, listened to its lullaby on the tent canvas before he slept. Yes, the rain was the same.

"Look," said Ernie finally, stopping his pacing. "We're all in this thing together, right?"

"Sure, Ernie," Martin Ashley said, knowing what was coming.

"Then what say we can all the cryptic references to unsolved primitive mysteries, Martin. We don't have to take orders from you, you know. We've sat on our tails for nearly three months, and still no dope from you on how to proceed. Call me crude, Martin—I want a woman and a decent house and a chance to make something out of this flea-bitten place."

There was tension in the cabin, then; the ugliness of personalities that couldn't harmonize.

"I don't recall giving any orders,

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Ernie," Ashley said. "Just advice. Whether you care to take it or not is strictly up to you."

"Ernie's right though, Mart," Bob Chavez spoke up. His voice was tired. "If we're going to play this game, we've got to know the rules."

Martin Ashley shrugged. *Rules? There were no rules out here. Space was long and space was deep. Here were only brains and feelings and wind in the night.* "No secrets," he said. "I just don't have much to tell."

"Tell it anyway," Ernie suggested.

Ashley took his time cleaning his pipe with a pocket knife. He loaded it with his own private blend of bourbon-soaked tobacco, which no self-respecting smoker would touch with insulated tongs, and lit it with that most efficient pipe-lighter of all, a big wooden stick match. He chose his words carefully; knowing that he wouldn't be believed.

"In a nutshell," he said slowly, "I think the Nern are very much more advanced than we are. I think that if we step out of line we're going to get our fingers burned."

Harder now, the rain beat down outside, and heavy thunder rolled in from the distant hills.

The others stared at him.

Ernie Gallen jerked his thumb at the huts in the rain. "Them? More advanced than *we* are? Without even the wheel? You're nuts, Martin, just plain nuts."

"Thank you," Martin Ashley said.

Ernie hesitated. "I'm sorry," he offered finally. "Didn't mean it that way. We're all in this together."

"Sure," Ashley said.

"There *is* the cigarette," Bob Chavez said wearily. His face was pale. "I don't understand that, not at all."

Martin Ashley waved his hand. "Forget the cigarette for now. I've

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thought that one over. There isn't any technology to speak of on this planet, unless it's hidden in a cave or something, and that's plain garbage. That cigarette came from some place else, which raises an interesting problem or three. But let it go for now. It wasn't referring to the cigarette."

"What then?" demanded Ernie irritably. "How could you possibly—?"

Martin Ashley sucked on his pipe. *Where are the words? There are no words. It is like the small boy who asks, "Daddy, tell me about the stars and things. And hurry—I've got to go play."*

"I can't explain it all to you," he said, "any more than you can make me an expert radio technician in ten minutes. But I'll try. I warn you that a lot of this is going to sound considerably more subjective than it actually is, but you'll just have to listen and decide for yourselves."

"Just don't throw it too far over our heads," Ernie said with only a trace of sarcasm. "We'll try to catch it."

"Look at it this way," Ashley began. "It's easy to count and identify the various items in a culture—a totem pole here, a spear there, a feather cape somewhere else. It isn't even hard to pick out elements of social organization—here a clan, there the couvade, back yonder a parallel cousin taboo. Unfortunately, however, all that isn't too important. It doesn't tell you much that you need to know if you're going to understand a culture. What counts is *how these things are put together*. Cultures are not just collections of random ideas and spear points, you see. They are dynamic, integrated *systems*—blueprints for living."

"You mean like patterns?"

Martin Ashley had been expecting that one. "Think of it that way if it helps," he said. He blew a fat, wobbling smoke ring out into the rain. "The point is this: all the ingredients are here, and they all seem simple, if a trifle idealized. But how do they hang together? What is the organizing principle? How does the thing *work?*"

"You tell me," encouraged Ernie.

"I don't know; and I'll be the first to say so. I can't get to first base with these people. But I'll tell you this—this isn't any primitive culture; and the Nern are not a primitive people. It all *looks* primitive, but it isn't. Remember our friend Einstein in his shorts, getting sunburned on the beach. Maybe you've heard of convergent evolution—two lines of development that follow entirely different paths but come out looking alike on the surface? Well, pal, this is it, and we are right in the big fat middle of it."

Ashley could sense the skepticism in the room.

"Hold on a minute," he said. "I'm not through yet. I want to give you two facts to roll around inside your skulls." He smiled pleasantly. "First, consider the contact situation. We came zooming down out of the blue in a spaceship, went right over their

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village, and parked out there in the grass field. A few hours later, and out come three Nern to say hello. They aren't afraid of us, and what's more they obviously aren't even very *interested* in us. As for the ship, they hardly give it a glance. Old stuff, do you see? Standard operating procedure. Another day, another spaceship. But at the same time their village and their culture shows absolutely no traces of anything taken over from a 'higher' culture—no steel knives, no rifles, no plows, no fancy pants, no junk jewelry, no *nothing*. That's something to chew on a while, gentlemen. Nothing spectacular, nothing that hits you in the eye, no signpost with a big *MYSTERY HERE!* painted on it in letters ten feet high—but how do *you* explain it?"

Nobody explained it.

"O.K. Second, there's the little matter of the Nern language. For purposes of communication, they taught me—and I tried to teach you—a simplified jargon, on about the *this is a book—the book is brown* level. All very well—the complexity of a language tells you very little about the complexity of a culture. But the kicker is that the jargon isn't their language! They actually have an extremely intriguing linguistic set-up that I'm just now beginning to get the drift of. Basically, they've got about ten different verb classes—and the type of verb you use indicates your authority for making the statement you make. That is, it tells whether your information comes from first-hand knowledge, or from a reliable authority, or from hearsay, or what-have-you. Neat, eh? This sort of thing has popped up before, of course—there was an American Indian language called Wintu that was set up along much the same lines. But the important thing is that they *edited* their language when they taught it to me—they revised it down to my level to make it easy for me. That just plain doesn't happen. Explanation, please?"

He puffed smoke in a blue cloud at the ceiling.

Bob Chavez was silent and shifted uncertainly on his wooden stool. His eyes had a tired, distant look about them. The eyes bothered Ashley, vaguely. Where had he seen eyes like that before?

Ernie said, "So what? So they're unusual. So they elude your keen scientific mind. They're stiff savages, Martin, and all your books won't change that. As for the cigarette, I say cross that bridge when we come to it—if we come to it."

Ashley smiled. "O.K., Ernie. Just close your eyes and maybe it will all go away. You asked for my opinion and you got it. I may be wrong—I've been wrong before. You go play Og, Son of Fire." He pointed, out into the wet village streets. "Go on out and tell them all about the wheel."

Silence then, for a long time.

"Let's don't argue any more," Bob

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Chavez said suddenly, in a voice that was fuzzy with weariness. "I. . . . I don't feel so good."

Martin Ashley put down his pipe in alarm and stepped over to the kid. He looked at him, remembering now. He felt the kid's forehead. It was icy cold. Even as his hand rested there, the heat flowed back again and the chill became a fever.

"Get to bed, Bob," he said slowly.

Martin Ashley and Ernie Gallen stared wordlessly at each other in the gray light. There was no need to speak, and nothing to say. They both remembered the *Juarez*.

Outside, the rain came hammering down in dull gray sheets.

Six hours later and it was night. The driving rain had once more become a drizzle.

Bob Chavez, obviously, was dying. He was unconscious now, and did not stir on his bed. His face was alternately too pale and flushed red with blood.

The disease had struck again. They had found the planet safe as far as they could tell, and that probably meant that they had carried the disease with them from the *Juarez*. It had waited, dormant, biding its time.

And now—

And now it had come back, in a little cabin on a new world. Bob was very sick, which was bad enough, but that wasn't all. Martin Ashley and Ernie Gallen had exchanged no words, but they both knew. Each man could already feel the symptoms in himself. Gallen had had the disease once, and Ashley had watched fifty-one people die of it.

He remembered:- *Fifty-one down and three to go.*

"It's faster this time," Ernie said, breaking the long silence. "A lot faster." He sat down on his bed and wiped the sweat from his forehead with a handkerchief.

The rain pattered gently on the roof, eternal and unconcerned.

Martin Ashley licked lips that were suddenly dry and parched. He felt his blood pounding through his veins, heavy and sluggish and sick. He listened to Bob Chavez, breathing in short, harsh gasps in the darkness. So quickly, then, did death come in and win all arguments—

The night was slow and very long.

An hour passed. Without a word, Martin Ashley went over and picked up Bob Chavez in his arms.

"What are you doing?"

"Going for a walk."

"In the rain?"

"I'm taking the kid to see a doctor." His brain was spinning now, and it was hard to hold on to it.

Ernie Gallen surged weakly to his feet. "You crazy fool—to that witch doctor?"

"He got his M.D. at Johns Hopkins," Ashley said, feeling giddy.

"You're crazy! I won't let you do it."

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"He can only die, Ernie."

"I won't let you!"

Martin Ashley smiled slowly. His mind, suddenly, was crystal clear. Calmly, he put the kid back on the bed. "Ernie," he said, "if we don't get out of this, I want you to remember one thing: you give me a pain."

He moved in fast, on dancing feet. He swung just once, his fist coming up in a long arc almost from the floor. It had every ounce of Ashley's strength behind it, and it landed with a crunch on the point of Gallen's jaw.

Ashley didn't even look at him. He picked Bob Chavez up again and staggered out into the drizzle and the darkness. The kid was terrifically heavy, like a lead sack in his arms. His feet slipped and sloshed in the mud and his hair plastered itself down over his eyes.

The fever was getting him now. He was burning up. Insanely, he wondered why the drops of rain on his forehead didn't boil away into steam. He couldn't think clearly and his feet got all tangled up when he tried to walk.

He fell twice, and the mud felt cool.

Where was the *Juarez* now, he wondered, out there beyond the rain? He thought he could hear it: "THIS IS THE *JUAREZ*, SURVEY SHIP FROM EARTH, SEPTEMBER TWENTY, TWO THOUSAND AND SIXTY-SEVEN. UNKNOWN DISEASE HAS KILLED FIFTY-ONE OF FIFTY-FOUR. THREE REMAINING MEN HAVE TAKEN SHUTTLE TO FOURTH PLANET, SYSTEM OF CARINAE. CONDITIONS THERE UNKNOWN—"

He began to laugh. He heard himself, and stopped.

He saw the dark structure before him and fell through the door of Rondol's cabin. He twisted as he fell, breaking the kid's fall with his body.

"Sick," he said from a thick, oily blackness. "Sick. Needs a doctor—"

From somewhere, from nowhere, strong hands touched his shoulder, and he knew nothing more. There was only the rain, the warm and soothing rain, forever.

V.

Martin Ashley woke up.

The sky was over his head and it was a brilliant, astonishing blue. He lay very still, not trying to move, just looking at it, drinking it in. The air around him was warm and clean and filled with the sharp sweetness of pine.

He was well. He knew that instantly; no trace of disease was left in his body. Very vaguely, he seemed to remember long chants and singing and herbs in his mouth. But all of that was long ago, and now there was only the blue sky, and the lazy delight in just being alive.

He glanced to one side, and there was Bob Chavez. Like himself, he was lying on a bed of leaves, covered with

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a light blanket. His face was clear, his eyes unclouded, and he was smiling weakly.

"Tell 'em about the wheel," Bob Chavez whispered.

Ashley smiled back at him. He tried to think, but the effort didn't seem worth the trouble. He relaxed and let the soft air wash over him as he drowsed.

"Feeling better?" asked a voice out of a great distance.

He opened his eyes again. It was evening. Rondol was crouching by his side. The shaman had lost much of his earlier brashness, and now seemed almost gentle.

"Much better," he said sleepily. "Thank you, Rondol."

Rondol frowned. "The other one," he said, "the one who was always so certain about things—"

"Ernie?"

"Yes. He would not let me help him. I went to him as soon as I found the nature of your trouble. We started to sing him well, to call on the good forces to assist him, but he cursed us and demanded that we leave." Rondol shrugged. "We left. He is dead. We have disposed of the body."

Dead. Fifty-four had boarded the JUAREZ, and now two were left.

Martin Ashley was still foggy with sleep. Undoubtedly, he thought, he had been drugged. Rondol's voice drifted down to him from a great and misty height.

"Soon now you will leave us, Martin. We have studied you enough; we would not endanger your lives further and have you think badly of us."

Studied us? Studied US?

He tried to think, but he was too tired. It was good just to lie quietly, listening to the wind and the sounds of the coming night. He slept.

It was morning when he opened his eyes again—a bright, clear morning that hurt his eyes. And the morning was filled with sound—a thundering, splitting *crack* that swept down from the skies and reverberated through the hard-packed village streets. He caught a glimpse of it, silver in the sun, flashing high above the trees in a deceleration orbit.

A spaceship.

And a big one.

The ship stood on her tail and came down. Martin Ashley watched it lose altitude, hanging in the air like a skilled swimmer treading water, until the tall pinelike trees hid it from view.

A whining hum continued for a long minute, and then the silence came again, even louder in his ears. The world rushed in to fill the emptiness, with whispers of wind and trickles of water rushing over rocks and murmurs of village life.

The ship had landed—obviously out in the grass field, near the empty shuttle from the *Juarez*.

Rondol helped Ashley to his feet, and kept a hand on his shoulder to steady him. Catan himself, the "chief"

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of the Nern, assisted Bob Chavez. A girl, whose name was Lirad, led the way out of the village and down the pathway under the trees.

Still a little confused and uncertain about what was happening, Martin Ashley turned once, back to the village of the Nern, to bid it a silent farewell. At his side, Rondol seemed about to speak, but said nothing.

Unbelievably, they were leaving. *Going where? Going where?*

They walked along under the pines until the forest ended and the field of tall grass was before them. There in the sun rested the mighty spaceship that he had seen as a silver speck in the air, and beyond it lay the shuttle that had carried them to Carinae IV. The shuttle was dwarfed into insignificance by the towering giant that dominated the field.

The three Nern eyed the great ship with neither envy nor curiosity. Ashley watched them closely. There was, he decided, a certain affection in their eyes, but that was all. *As a man might look back on the well-remembered toys of yesterday's childhood.*

"They are more of our star-brothers," Catan said quietly. "Do not fear them. They will take you to your homes."

Martin Ashley started. Everything was happening so fast that he could not organize his thoughts. He had given up the Earth as forever beyond his reach, and now suddenly Catan spoke of home. Ashley felt conflicting emotions chase themselves through his brain, and he tried desperately to say something—something for which he knew no words, in any language. He felt that he had caught a glimpse, a mere suggestion, of something fine—and now it was to be taken from him, and he was free to go home.

He said nothing, because he did not know how. Bob Chavez, too, was silent at his side.

"We will miss you, Martin," Rondol said. "You are a good man."

And then the girl, Lirad, was before him. She was not beautiful by ordinary standards, but her dark hair framed the most sensitive face that Ashley had ever seen—sensitive and at the same time firm with strength and humor. Why had he never noticed her before? Gently, she touched his shoulder with her hand. She looked deep into his eyes, smiled faintly, and said nothing.

So few words, so little time remaining now. But Ashley knew that something had passed between himself and the Nern, something new, something that was his if he could just reach out and grasp it.

Too late.

Two men, crisp and uniformed and efficient, came out of the ship, exchanged friendly greetings with the Nern, and took charge of the two men from Earth. Carefully, they led them through the field of grass and up into the ship that towered into the heavens.

The sun was gone, and the village,

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and the pines. Now, again, there were the metals and the machines and the hummings and buzzings and clickings. And the alert faces, the ordered activities, the jokes and the skills of men in uniforms.

"Welcome aboard, gentlemen," said the captain, speaking to them in the language of the Nern. "Make yourself at home."

The cushioned take-off and the smoothly compensating gravity pull told Martin Ashley that here was a ship that made the old *Juarez* look like a crude experiment, a toy for the Fourth of July.

"Tell *them* about the wheel!" enthused Bob Chavez, his face alive with pleasure.

Martin Ashley smiled back, still trying to organize his thoughts. It had all happened so quickly—

He knew only that he was in space again, and the Nern were gone.

One "day" later they landed on Carinae V.

They stepped out into an enormous concrete spaceport, the biggest that either of them had ever seen, with green gardens on top of the walls and the towers of a white and gleaming city sparkling in the sun beyond.

"This, I believe, was the planet that had no technology," Bob Chavez said wryly. "Looks like our initial survey made a slight miscalculation."

"They did indicate two planets that seemed ecologically O.K., if you'll remember," Ashley pointed out. "But they seem to have gotten their decimal point in the wrong place. In fact, they didn't even *have* a decimal point."

It was all very swift and very courteous. A smooth, fast copter picked them up and flashed into the city, depositing them on a tower roof. A silent elevator plunged them down into the depths of the building and let them out on the twenty-fifth floor. The door opened directly into a large office—cool and tasteful, with remarkable paintings on the walls and a window that looked out on a roof garden that was a riot of color.

A man got up quickly from behind a desk and came toward them, hand outstretched in true Earth-fashion. He was a big man, well over six feet tall and weighing an easy two hundred pounds, with unruly brown hair, sloppy clothes, and open, friendly eyes.

"Very happy to have you with us," he boomed in flawless English, his big voice filling the big room. "Very happy indeed! Smoke? Drink?" He laughed, and his laugh was as big as he was. "Sit down."

Martin Ashley sat. He was still a little weak, and beginning to feel painfully like a small and rather stupid child. The big man's personality was like a blow in the face, but Ashley liked the man on sight. To cover his nervousness, he fished out his pipe, took his time loading it, and lit it with a stick match.

"My name is Shek," the big man

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said. He shook out a cigarette, and one mystery was solved. It was identical to the one that Ashley had found that night, so long ago, outside the village of the Nern. It puffed into a spark as Shek held it in his fingers, and he promptly hung it miraculously in the corner of his mouth and went on talking. "Name sounds moronic I know, but Martin Ashley is a howl too, or would be if you were me."

Shek paced the floor, puffing up clouds of smoke which the air conditioner valiantly tried to blow out the window. He had plenty of room to pace in, and he needed it. "Look here," Shek said, "I know what you guys must be thinking, so let's get the questions out of the way so we can enjoy ourselves." He jabbed a big finger at Martin Ashley. "Matter of fact, you already know the answers; if you'll just get up on your hind legs and dredge 'em up."

Ashley smiled dubiously and concentrated on his pipe.

"I'll show you," Shek said. "*I'll* ask the questions. One, How come you didn't pick us up on the *Juarez* survey?"

Ashley hesitated. "You're screened, I guess," he said.

"Of course! Only possible answer. See—you know more than you thought you knew already. Long story, and probably very dull to you, but the upshot of it is that we prefer to contact others instead of having strangers barge in on us all the time." He slammed his fist into his hand with a resounding whack. "You've no idea the creeps there are blatting around in space, present company excluded of course. Why, would you believe it, one crummy outfit came down here before we had the screen set up and tried to *colonize* the joint!"

He boomed his big laugh again, and Martin Ashley felt a bit uncomfortable. That shot had come just a trifle too close to home.

"Yes, sir," Shek hurricaned on, shooting off words like strings of firecrackers. "Next question: How did we know where you were, and when to pick you up?"

"Well, you could have picked up the message from the *Juarez*," suggested Bob Chavez.

"Or the Nern got in touch with you somehow," Ashley added. He was feeling a little better and essayed a smoke ring that wobbled across the room and out the window.

"Nice smoke ring!" complimented Shek. He blew one himself and beamed proudly. "Both of your answers are right, of course. We picked up the message from the *Juarez* right away, and we knew you'd be O.K. if you didn't pull anything stupid. Then Rondol gave us a buzz."

"How?" asked Ashley, beginning to feel dumb again.

"Usual way," Shek laughed, still pacing up and down, trailing smoke. "We do a little . . . ummm . . .

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trading with Rondol and the boys, you see, and we have to contact them occasionally. So there's a good transmitter down there—Rondol's is in the club house in the middle of the plaza; I don't guess you got in there."

Ashley shook his head.

"You're doing fine," Shek assured them. "Next question: How about my English? Good, huh?" He grinned boyishly.

"It's not only good, it's fantastic," agreed Ashley. "I guess you got it from Rondol, but I didn't even know *he* was learning my language while he was teaching me his."

Shek inhaled another cigarette. "Sure. Smart cookie, Rondol! He sort of picks things up, you see. Best doctor in the system, too. You gentlemen were lucky."

"We know."

"Well," boomed Shek, "so much for the inevitable questions. I told you that you knew all the answers before we started!"

Knew all the answers? I hardly knew the questions!

"Here's the deal," Shek told them. His idiomatic English was so absolutely flawless that it was hard to believe that it was not his native tongue. And he had learned it in a few short months. Martin Ashley was almost beyond amazement. If Shek had suddenly sprouted wheels and roared off down the hallway, he probably wouldn't have flickered an eyelid. "We've got a ship going to Centauri the day after tomorrow," Shek said. "We've made it a point so far to avoid Earth shipping, but that's your ride home. We'll leave you there and you'll be picked up in a matter of a few days, I would imagine. Lot of traffic out that way."

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"Home," said Bob Chavez slowly. "I'm really going home."

Martin Ashley smoked his pipe and said nothing.

The interview, if such it could properly be called, wore on until long afternoon shadows began to filter down into the vast canyons between the white towers. Martin Ashley felt himself gradually relaxing. The big man was a comfortable sort to be around; he was one of the few men of his type that Ashley had known who was neither a phony nor an ass; Shek really *was* frank and good-natured, and it was a stupid man indeed who failed to catch the glint of sharp intelligence in his eyes.

Martin Ashley relaxed—and that meant that he could think again. It wasn't a brooding kind of thought that made him perpetually occupied with Big Problems, which were usually far more ridiculous than many of the "little" problems that all people faced just in the course of growing up and staying alive, but rather a keen curiosity that operated almost on a subconscious level, periodically stepping forward to demand his attention. He had been asking questions ever since he learned how to talk, and for better or for worse it was far too late to stop now.

"It's so astonishing," Bob Chavez was saying, shaking his head. "All this, I mean. A few hours ago we were in the middle of nowhere, cut off forever from home and people like ourselves, and now here we are—in this fabulous city, comfortable, and with a ticket for home in our pockets."

Martin Ashley changed the subject; they had, he figured, about wrung that one dry. "How long have you been in contact with the Nern?" he asked slowly.

Shek smiled. "It's been a long, long time," he said. "Not just the Nern, but all the other peoples on Carinae Four. We've been in contact for thousands of years. You might say that we sort of grew up together."

Ashley eyed Shek and asked the question that he had been framing for the past fifteen minutes. It wasn't worded as a question, but he knew that Shek would catch its import. "You have been remarkably restrained and wise," he suggested, "in not interfering with their culture. I could see no signs at all that you had tried to make it over in your model, and it must have been a powerful temptation—so close to you, and such a large potential market. Your hands-off policy is practically unique for a culture as highly developed as this one."

Shek laughed his big booming laugh and stuck another cigarette into the corner of his mouth. "Ashley," he said, "you know better than that. The fact is that *they* have been remarkably decent to let us go on our own way as best we could!" He shook his head. "Believe me, it would be utterly fantastic for us even to con-

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sider fooling around with the Nern culture—that's a fast short-cut to oblivion." He stabbed his finger at Ashley. "We're not trying to *teach* them anything—we're trying to learn!"

Martin Ashley smiled with a certain inner satisfaction.

He had known the answer to that question in advance, too.

VI.

It was the next evening, and the lifting of the ship for far Centauri was only fifteen hours away.

Martin Ashley had left Bob Chavez at the spaceport and had more or less invited himself out to Shek's country home. It hadn't been very difficult, actually, since the two men had taken an immediate liking to each other.

It was a charming home, set in a landscaped square of grass and flowers. Shek's wife was just the opposite of her husband, at least on the surface—she was cool, poised, and unobtrusive. The couple had two small children, both girls, who proceeded to chase each other around the living room until they were made to go stand in the corner by their mother. Ashley was vastly amused by the punishment meted out to them—it seemed that methods of disciplining children didn't change very much even across the gulf of light-years.

Only Shek could speak English, of course, so Ashley had to let smiles and nods do his talking for him. He had a tall cool drink in his hand, which Shek had made with more care than Ashley ever expended on his own drinks, and he experienced a curious duality of feeling that he had known many times before. At once, he was both an outsider and a family friend. He liked it here, and felt that he was liked in return, but somehow he didn't fit. He was honest with himself about it: he envied Shek his life, and yet he knew that he could never live that way.

"Shek," he said finally, "there's some information I've got to have, and I've come to you to get it. I've very little time left now, and I want you to help me fit some pieces together."

"I'll try," Shek agreed readily. The big man was more subdued in his home than he was in his office, and his thoughtful side was much more in evidence. "Shoot."

Martin Ashley sipped his drink, which was delicious. "Ever since I left the *Juarez* and headed down for Carinae Four," he said, "I've been sniffing around like an ape at a power generator. I knew there was something utterly out of the ordinary about that planet from the very first, but that's no answer—it's just a problem. I saw right away that the Nern were not so simple as they seemed, and I tried to act always on the assumption that they were not primitive, no matter how they looked on the outside. I knew I was right, and you confirmed

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that for me yesterday when you told us, in effect, that they were way ahead of you, just as you are way ahead of us—"

Shek raised his hand, objecting. "Let's just say different," he said. "Or more complex along certain lines. This business of being 'advanced' is a pretty subjective thing, in my opinion."

"Correction noted," agreed Ashley readily. "But we won't try to solve *that* particular problem tonight. But here's the point, Shek: I know what the Nern are *not* and I have for a long time. But I don't know a blessed thing about what they *are*." He paused. "Shek, I've got to know. Don't ask me why."

Shek eyed him carefully. "I guess you do, at that," he said. "Of course, I can't pretend to tell you the inside story because *I* don't know it all, either. I can give you the general picture, that's all."

"That'll be plenty," Ashley assured him.

"O.K., Martin. Here, let me fill up your glass again. This will take a little time."

Martin Ashley leaned forward, hoping that he did not look as excited as he felt.

This was the story Shek told, while the evening shadows marched in steady shadow files on into night.

Man, wherever he is found, is a strange and much misunderstood animal. It was not so much man's famous "better brain" that made the difference, although he had that, too. Rather, it was his ability to symbolize and thus to be a carrier of culture. The growing totality of culture was passed on from generation to generation, and individuals were born into functioning systems that they themselves had done little or nothing to bring into being.

Each new person did not think up for himself the ideas of cooking food or playing football or using electricity —he just did them "naturally," because "everybody did it that way."

Now, culture is a learned process, which must be taught and absorbed, which is why human children are "helpless" for so long and why they must spend almost half of their lives going to school in one form or another.

As cultures developed, a knotty question appeared: *What happens when the culture is so complicated that one person can't possibly learn it all?*

Technological processes snowballed whenever they were set in motion, and when technology changed so did the rest of culture. Cultures ballooned—from cave-dwellers to villages to mammoth cities, from stories told around campfires to libraries filled with so many books that it took a special staff just to keep track of them all.

There *was* too much to learn. What was the solution?

One way out, the way unconsciously selected by Earth and by the people

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of Carinae V, was to learn a small core of culture and then specialize with increasing minuteness in a technical field. The results were sometimes painful: scientists who neither knew nor cared about the effects of what they did in their labs, soldiers who fought without knowing why, governments that legislated in mental darkness, writers who wrote glibly about problems which they were incompetent to understand. Men learned and learned and worked and worked and piled up more and more for the next generation to wrestle with—and for what?

For fun, and for an old-age pension that they never learned how to enjoy.

There was another solution, and the Nern had taken it long ago. *They edited their culture down to essentials, and learned to live in it.*

The very concept of editing a culture assumed an awareness of what culture was—a learned process, the result of arbitrary history, and not an instinctive "right way to do things," as opposed to all other ways, which were wrong. Getting this idea across to a population was the biggest hurdle to be faced, and when it was done the rest was relatively easy. The Nern handled their indoctrination in what appeared to be a rite of passage, an initiation ceremony for children. It was, indeed, an initiation—the children had been brought up to cherish the ideals and beliefs of their culture, and now they were told and shown that these ways of living were arbitrary and could be changed. This did *not* mean that they were no longer to value them—but only that they must be critical of what they valued, and capable of rational evaluation.

There was another problem, or rather two problems. What *was* essential, and essential for what?

The Nern took as their goal the value of survival with maximum integration, cohesiveness of function, individual fulfillment, constant challenge, and peace. It was no Utopia, of course—this was a real culture, with real human beings in it, with real hopes and fears and sorrows.

They were not helpless, not even after they had decided against a machine culture multiplied forever. They really *knew* culture, which was man's most distinctive possession. They were masters of the culture process—they knew what seeds to sow in other cultures to produce almost any desired result. They knew the pivotal points of cultures—they could, at a distance, through psychology and hypnosis and adroit cultural appeals, turn an enemy into an ally or tear it apart with civil war.

They had found the true "uncharted corridors of the mind," and they had explored them thoroughly.

On the surface, as Ashley had observed, there was a surprisingly uniform planetary culture, with a mixed economy and only the simplest sort of tools. There were shamans and

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rituals and moiety-type social organizations. There was an elaborate series of myths about the star-brothers, with their campfires in the sky.

But underneath it was different. *Very* different. Under the surface of that "uniform" planetary culture was tremendous cultural diversity. Each group was unique in the way the elements were put together, in the dominant values by which the culture lived. The hunting and gathering and fishing and limited agriculture served to tie the people to their land, and make them appreciate it, in the absence of a market economy. They had found machines to be useful, and certainly not "bad," but they had found that machines carried a price tag which they could not afford.

One solution to a specialized system was to build robots; another was to eliminate the useless jobs entirely. Their crops were non-tedious in nature, requiring very little time and yielding a large return. At the same time, when you ate a meal you knew where it came from and did not take it for granted. The shamans were genuine doctors; they combined advanced psychosomatic medicine with "herbs" similar to natural wonder drugs and sound surgical techniques, and they kept the chants and the singing so as to avoid divorcing science and religion. The rituals restated the values of the culture, and were regarded as both good fun and as efficient structuring devices for the society. The attitude toward them was not unlike that found in America toward Santa Claus—something which only the children believed in literally, but which all the adults could appreciate and participate in. Their dual division of society was a nicely integrated system that provided a framework for sports and games and dancing contests, and their preferred marriage systems were quite workable forms of social insurance. Their language was designed to emphasize cultural tolerance and objectivity. And who could be pressed for time, when it was all the same day, repeating itself forever?

It was not a perfect system, and they knew it. It changed all the time, and its people were human enough to foul things up now and then. But it was a try, a way of doing things, and whether it was better or worse than other ways depended pretty much on how the observer felt about such things.

The Nern had substituted philosophy and songs and dancing for books, and their philosophy was only simple on the surface. The stars were their brothers, because they had sensed a genuine unity of all life everywhere; it was all related because it was all the same process, and to the Nern that was kinship.

And there was the sun, and the trees, and the sounds of happy people. Perhaps, in a way, that was the best of all. The population was small, only some four million people on the whole

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planet, but they did not place their value in numbers.

"That's what I know about the Nern," Shek finished, putting down his cigarette which promptly went out. "And now it's very late. Come along, Martin, and spend the night with us. I'll drop you off at the spaceport in the morning."

"Very kind of you, Shek," Ashley said. "Thanks."

He had a room on the second floor, a room with a window open to the cool night air. He lay awake for a long time that night, looking out at the stars, the star-brothers, the ancestral dead and the never-born, sitting around their campfires in the sky—

It was dawn when he slept.

The great gray ship that was bound for far Centauri, one hundred light-years away, pointed her slim snout at the noonday sun and waited.

Martin Ashley had had two tough decisions to make, and he had made them both. He stood with Bob Chavez at the lock elevator, waiting for it to go up and into the ship. The ship towered over his head, a metal giant, pointing.

Quite suddenly, the Earth seemed very near.

"Good-by, Bob," he said, holding out his hand.

Bob Chavez shook it firmly, and he made no attempt to argue with Ashley about the decision that he had made. *Funny what a few months will do to a boy,* Ashley thought. *Bob has become a man.*

He would miss him.

"Best of luck, Mart," Chavez said. "Sorry I was such a brat at first."

"You were good company," Martin Ashley said. "Perhaps one day we'll meet again."

"Perhaps. I hope so. I'll tell Earth you said hello."

A light flashed and the elevator lifted. Bob Chavez was gone.

Old Alberto Chavez would be proud of his son now, but he would never know. Martin Ashley smiled a little. *Fifty-three down and one to go.*

He turned and walked away from the great gray ship, the sun in his eyes. He was very much alone. He walked as fast as he could, and he did not look back.

One week later, Martin Ashley was in space again.

The big ship from Carinae V had maneuvered with rare skill to pace the empty hulk of the *Juarez,* still circling in its endless satellite orbit about the planet of the Nern.

In a wonderfully light and flexible spacesuit, Martin Ashley pushed himself across to the ship that had been his home. Shek went with him, and they went through the emergency lock together.

There were still enough lights on in the *Juarez* so that they could see, but somehow they just made the gloom worse. There is nothing more depress-

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ing than a dead ship, and the *Juarez* was dead. There was nothing left now but one mechanical voice, and ghost memories of the dead and the darkness prowled through the hollow rooms and passageways.

In the silent control room, Ashley flicked on a ship amplifier. The message still came, endlessly repeating from the recording, sending Ashley's own words of a lifetime ago drifting into space:

"THIS IS THE *JUAREZ*, SURVEY SHIP FROM EARTH, SEPTEMBER TWENTY, TWO THOUSAND AND SIXTY-SEVEN . . . SHUTTLE TO FOURTH PLANET, SYSTEM OF CARINAE . . . WILL MAINTAIN CONTACT . . . SURVIVORS ARE ERNEST GALLEN, RADIOMAN; ROBERT CHAVEZ, APPRENTICE PILOT; MARTIN ASHLEY, ANTHROPOLOGIST. MERRY CHRISTMAS TO ALL . . . THIS IS THE *JUAREZ*."

Martin Ashley canceled the message and turned off the transmitter. There was no need for it now, with Ernie dead and Bob Chavez on his way back home.

The last voice of the *Juarez* was stilled, and neither Martin Ashley nor Shek broke the silence.

They turned out all the lights and went back to their waiting ship.

The ship flashed on—toward Carinae IV.

"In a way, I envy you, Mart," Shek said, "but it's not for me."

"It's funny," Ashley told him, "but that's just what I thought at your house."

"I'll be down to see you, sometime. Sometime soon."

"I'll be waiting."

And the great ship landed—in a sea of grass, beside a tiny shuttle that stood alone, an alien statue in the fields of night. Martin Ashley stepped outside, into the darkness, and moments later the ship from Carinae V lifted away into the great sea of space with a whine and a roar.

Martin Ashley trembled. For all of his life, he had been a man in search of something without a name. The search had taken him into schools and across the light-years, and once, with Carol, he had almost found it. And now, after so long—

He was too old and had lived too deeply to believe that he had found it at last. Perhaps men never found it, and that was the secret that kept them going. But there was a chance now.

A chance.

The ship was gone, and there was the silence again, the silence of night and of land left alone.

Martin Ashley shivered.

He knew that the others were watching.

They came out of the shadows where they had been waiting for him—Rondol, Catan and the woman, Lirad.

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Lirad smiled and took his hand.

"Welcome, my son," Catan said. "We have been expecting you."

Hesitantly, Martin Ashley said, "I think I know about Bob. You . . . sent . . . him back to Earth, didn't you?"

Rondol nodded. "Your people are young and very aggressive," he said. "They found us once, and will again. We planted only a very small seed in your young friend—a seed that will flower just enough so that your people will be willing to listen and co-operate when next they come our way. You or your sons can talk to them, and we can be friends instead of enemies. Your friend wanted to go home anyway, you know; we did not harm him."

"I let him go," Ashley said slowly. "And myself? I must know that. I know that you will not lie to me."

"We did nothing to you, Martin," Rondol told him. "You were one of us from the beginning; you have always been one of us. Your decision was one of free will, at least inasmuch as any man ever has free will."

"Let's go, then," Martin Ashley said. "I'm ready."

He heard it before he saw it, as they walked along the pathway beneath the pines. Drums, and chanting voices in the night. And then he saw them waiting—the orange fires burning in the village of the Nern.

He had seen it all before, a long time ago, with Ernie and Bob, hidden in this same forest.

The rite of passage, the initiation ceremony during which the child passed into adulthood.

This time, he knew, it was for him.

He held Lirad's hand, tightly.

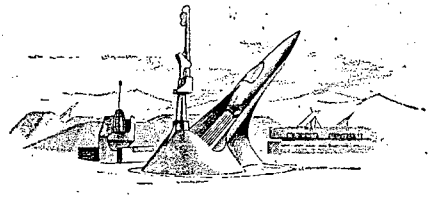
With a greater humility than he had ever known, and with a pride that burned like fire within him, he walked forward, toward the drums and the singing and the people who were waiting to take him in.

He looked up once. There they were, untold millions of them, his star-brothers, the old ones and the never-born, sparkling in the sky.

They smiled, understanding.

He walked on, shoulders squared, into the village.

THE END



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WASHDAY MINUS ZERO

BY WALLACE WEST

There are some things that are hard to wash out. Sometimes it seems as though atomic wastes were as tough to remove as a bad conscience! And when there's a really big spillover, such as a full-scale pile run wild. . . !

Just before Christmas 1952 a New York manufacturer of atomic instruments and supplies was snowed under with orders for a detergent called Radiacwash which it had been making as a sideline. Letters and telegrams poured in from universities, industrial companies and laboratory supply houses in northern New York state, Ontario and Quebec. Several inquiries asked price quotations on carload lots. All wanted their shipments in a great hurry.

Now the special thing about this detergent is that it contains liberal quantities of Versene which is one trade name for the tetra sodium salt of ethylene diamine tetra acetic acid. It is fine for washing dishes and clothes, softening water and preventing the formation of rings inside bathtubs. But Versene, or EDTA, has a much more important property. It is the most versatile complexing agent commercially available for picking up, surrounding and carrying away metallic ions. Radiacwash, therefore, had been finding widespread use at Oak Ridge, Hanford, Brookhaven, Argonne and other places where laboratory glassware and other equipment must be kept free from all traces of radioactive contamination. But these rush orders seemed to be something special.

M. M. Reiss, general manager of Atomlab, Inc., which manufactures this detergent, decided to investigate. So he tucked a Scintillometer, a Geiger Counter and other equipment in his car and started cruising. The Scintillometer is the latest thing in radiation counters and is many times more sensitive and accurate than the traditional

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Geiger. It is built around the sensational new photomultiplier tube and various crystals that fluoresce under bombardment by different types of atomic particles. The tube, a modification of the well-known photoelectric cell or electric eye, picks up the faint glow and amplifies it into a shower of photoelectrons. This, in turn, starts a chain reaction that triggers much more powerful secondary electron showers which can be accurately counted.*

The farther north Reiss drove, the higher his Scintillometer readings crept. In the neighborhood of Oswego, New York, the count was about twice that caused by normal earth background radiation. (The radiation peak in Nevada, after the third series of 1951–1952 atomic tests there, was not quite half of the natural background.)

Reiss noticed that the readings beckoned northward across the calm waters of Lake Ontario. So he decided that—the state of the world being what it is—he had better return to Manhattan and devote full attention to filling the continued flood of Radiac-wash orders!

The next development came when C. D. Howe, Canadian Minister of Trade and Commerce, made a brief official announcement. It said that, on December 12, 1952, a "slight" leak had occurred in a uranium rod at the Chalk River, Ontario, atomic pile known as the NRX Reactor.

Chalk River is a remote village—population two hundred according to the 1941 census but much larger now—about forty-five miles northwest of Ottawa as the atomic particle flies and near the Ontario-Quebec border. The reactor located there is believed to be—or to have been—the most intense in the world. It has the highest neutron density, sixty million of those uncharged particles moving through every square centimeter of the pile per second. It produces highly penetrating isotopes and also is used to study changes that neutron bombardment causes in metals.

The NRX was completed five years ago as an experimental plant and, until the burst mentioned above, had been in continuous operation. It cost forty million dollars and its yearly operating costs average seven million dollars. Its one hundred buildings, each equipped with a screaming alarm signal, occupy a ten thousand acre area and house between twelve hundred and twenty-five hundred workers, including five hundred scientists and technicians. Another reactor of similar type, the NRU, is being constructed on the Chalk River tract. This pile will feature improved automatic control mechanisms and easier handling of the uranium rods used as fuel.

Minister Howe's announcement, and statements by Dr. C. J. MacKen-

* A Geiger counts up to 20,000 radiation impulses a second; a Scintillometer 1,000,000.

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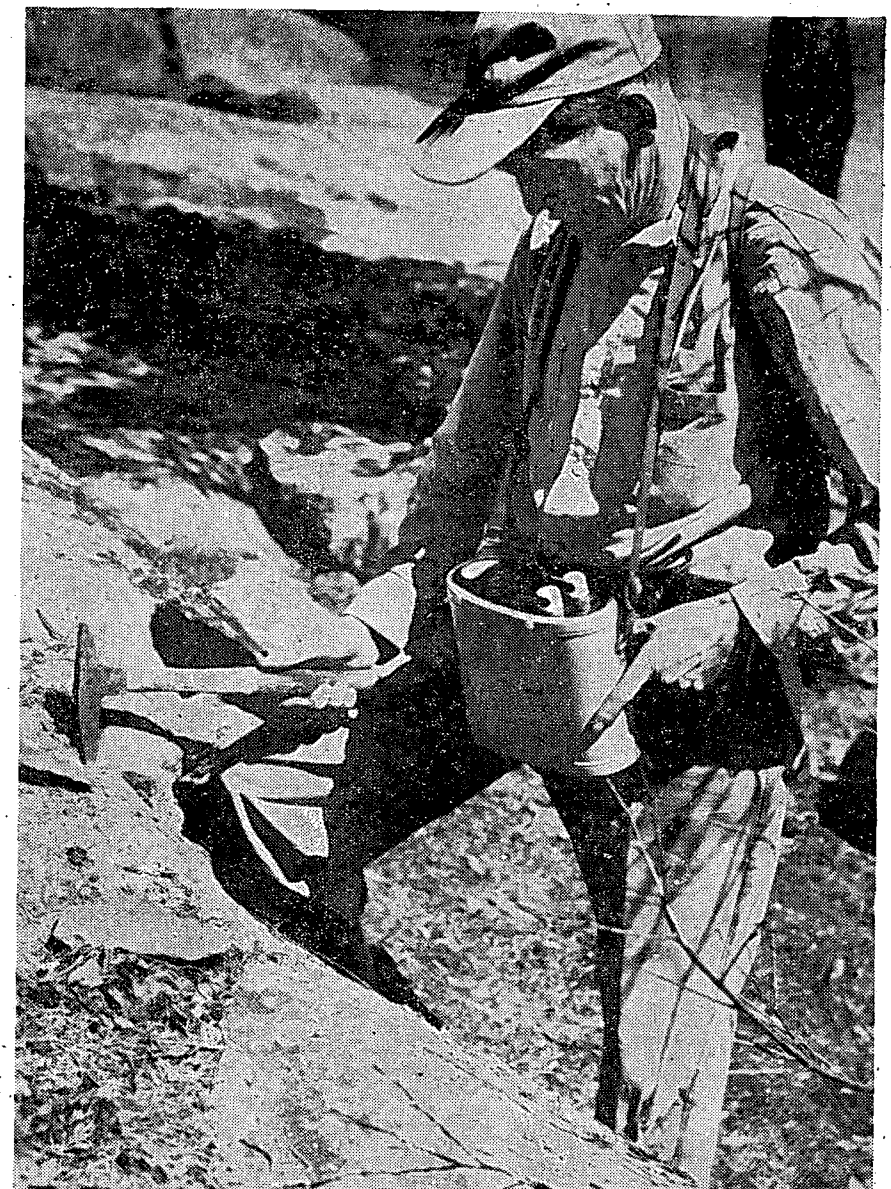

Courtesy of The Radiac Co.

The nuclear pile is one symbol of the atomic age . . . but there's another!

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zie, who runs NRX for the Atomic Energy of Canada, Ltd., noted that radioactive dust and gases from the burst had been carried up the reactor's two-hundred-foot-high exhaust stack. Due to heavy clouds and high humidity, it was added that those wastes had not been "widely dispersed."

It was considered probable that corrosion of the aluminum tubes within which the reactor's ten-foot-long rods of uranium fuel are sealed had caused a tiny perforation. Cooling water getting access to the uranium had extended the opening.

As a result, personnel was evacuated to nearby villages and the reactor was closed down indefinitely to allow it to "cool" so that an examination of the damage could be made. Scientists interviewed several weeks later indicated that it would take at least a few months to mend that damage. It was confined, they said, to a small area, but that area was packed as tightly as a watch with instruments and parts —and was drenched with radioactive water.

In concluding his official announcement, Howe said such bursts had occurred previously at Chalk River and in other reactors. They could be expected to continue, he warned, until more was learned about the behavior of materials being subjected to high irradiation.

The burst received little attention by the United States press, perhaps because no fatalities had been reported. *Nucleonics*, a leading trade magazine, mentioned Howe's announcement in its January 1953 issue. Then it did what investigating it could. The result was a more detailed story in its March 1953 issue, together with a leading editorial entitled "How Safe is Safe?"

The editorial warned that major atomic accidents are now possible; that much greater safeguards should be erected against them at once, and that the public is entitled to know what the United States Atomic Energy Commission is doing, or plans to do in this regard.

To get some idea of what must have happened at Chalk River, let's take a closer look at the few details published about the NRX reactor. It has, to begin with, one hundred seventy-six double aluminum tubes in the center of which are those long and awkward natural uranium rods. They stand upright in an aluminum tank full of the *heavy* water that acts as a radiation moderator and provides additional cooling. A gas cap of helium fills the space between the heavy water and the tank top. This helium may be used to prevent evaporation or to act as a leak indicator.

Between the tank and its eight-foot-thick concrete shield is a space through which cool air is pumped. The heavy water is cooled by constant circulation through a heat exchanger. The pile is controlled by moving cadmium rods

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in or out of the tank.

"The accident," says *Nucleonics*, "was the result of an unusual series of coincidences. The reactor had been shut down, and the flow of cooling water was considerably lower than that for full operation. Because of a misunderstanding, all the control rods were suddenly pulled out, and the power in the reactor built up very rapidly.

"This rapid build-up of power, combined with the small flow of water, caused at least one of the fuel rods to vaporize, and many thousands of curies of radioactive gases were carried up the exhaust stack."

The size of the blast is hinted at by the fact that, throughout the world, no more than five curies of radium have ever been processed! Since the plant had to be closed indefinitely, it is evident that a lot of hot stuff was splashed around the reactor itself. In fact, it was not until late June that the ruined aluminum tank and tubes became "cool" enough so that a truck could tow them to an out-of-the-way spot where men in gas masks and protective clothing buried them.*

United States reaction to the Chalk River burst was prompt. Gordon Dean, then AEC chairman, offered the fullest technical aid and assistance. When Canada accepted, he sent in a team of seventeen scientists and technicians, including several of the Commission's leading reactor experts and health-physicists, to study the damage and gain information about safety control methods and measures that should be taken to prevent similar accidents. (On AEC records the men were listed as ill or on vacation.) When the first group returned, Dean sent other experts, including Navy and AEC personnel, to help in decontamination work.

Meanwhile, arrangements were made to ship radioisotopes to the Dominion to meet all deficits caused by the NRX shutdown except for some extremely hot ones, like Na^{24}, that are difficult to obtain because of the lower flux of United States reactors. The government also loaned Canada money for reconstruction of the pile and sold her some United States equipment needed for decontamination and repair operations.

In announcing these moves, Dean added the wry comment that he could make such an offer only because "Canada has no law restricting its dealings with the United States on atomic matters."

This obviously referred to his proposal, made in a speech at Brookhaven National Laboratory at about the time the burst occurred, that very serious consideration should be given to declassifying a great deal of information on reactors located within the United States. On that occasion Dean

* This sequence of events, as nearly as it can be pieced together, bears an eerie resemblance to that described by Kelley Edwards in his novelette entitled "Radiation" published in the April, *1952*, issue of Astounding Science Fiction.

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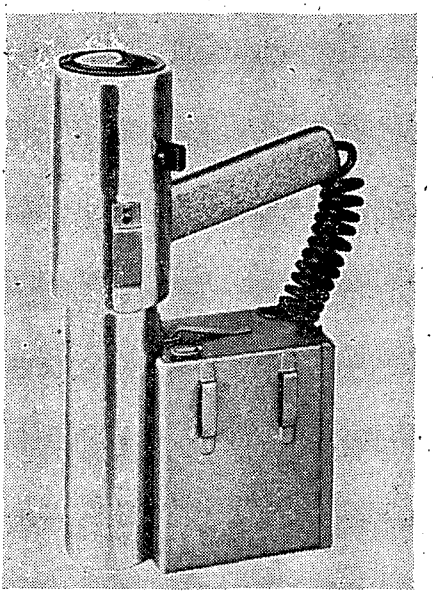
pointed out that-"reactor technology has reached the stage of development where such extensive secrecy as we now have will almost certainly hamper progress, if it hasn't begun to already." *

Nothing has yet been released about information gathered by the AEC teams although Dean has indicated that it should be of "substantial value." The Canadian burst has, however, served to focus some attention on the growing-pain problems of our six billion dollar atomic industry as well as its relationship with the public.

* Reiss of Atomlab goes even farther than Dean. He wants to *decontrol* a large percentage of the information now available regarding atomics. He contends that it is unwise and misleading to funnel all atomic news through a "facade" of AEC "educational and informational experts."



Courtesy of The Radiac Co.

The Geiger counter is giving way to the scintillometer . . . a hyperdevelopment of the fluorescent glass that first detected electrons.

The lead editorial in *Nucleonics* puts the situation in perspective. In it, Editor Jerome D. Luntz says in part:

"The work of the United States Atomic Energy Commission affects the public welfare as much as, if not more than, any other government agency—whether the work be bombs or peaceful applications of atomic energy or hazards from AEC plants. As the principal source of information, it is the job of the AEC to keep the public well informed on such matters . . .

"The time is long past on bringing the public up to date on the hazards of nuclear reactors, which are now dotting almost all parts of the country. This is very much in the public interest because, apart from military security, public safety is the main reason AEC requires tremendous remote reservations for its plants. Almost always, the potential hazards result from the use of fissionable material—in weapon assemblies or reactors—rather than mere handling of large amounts of radioactive materials.

"We're pretty familiar with the 'hazards' from weapons, but what are the hazards from reactors? Basically, they exist either in normal reactor

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operation or in the event of a 'major disaster.' In normal operation, there are two hazards: radiation emanating from the biological shield of the reactor; and radioactivity in the coolant issuing into the atmosphere or the public waters. Although both of these 'normal' hazards are not by any means inconsequential, they are pretty well understood and can be protected against without great difficulty . . .

"What is a 'major' accident? In its statement on the release of land in the Wahluke Slope area at Hanford, AEC said:

"'The real danger in the operation of Hanford exists in the remote possibility that one or more of the piles may go out of control; if any of these reactors ever go completely out of control, dangerous amounts of radioactivity may be released to the atmosphere. The reactors cannot explode like a bomb, but, under the worst possible conditions, they could produce so much heat that the fuel elements would melt, thus releasing a very dense and highly radioactive cloud—more dangerous than the cloud produced by an atomic bomb explosion.

"'The chance of a major accident or disaster occurring in one or more of the Hanford piles is small. There are safety devices that are designed to shut a pile down if it starts to go out of control.* Additional safety devices

Courtesy of The Radiac Co.

More compact, more rugged, and far more sensitive than the Geiger counter, the scintillometer is ideal for field use.

are now being incorporated. But there always remains the chance that all of these safety devices might fail simultaneously or be put out of commission by a natural disaster or by human action.'

"Was the recent accident in the reactor at Chalk River a 'major' one? Presumably it wasn't a 'catastrophe' as defined above (although it comes close to being one). But it will for the first time provide valuable data on what happens when a reactor 'runs away.' Although virtually nothing has been released to the public, both

* In other words, the pile is designed to "fail safe." Unfortunately, no two people agree as to exactly what that expression means.

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the Canadians and the United States will benefit.

"Another accident in which no public information is available is the one which took place last summer in an experiment with fissionable material at Argonne National Laboratory. This was probably considered a 'minor' accident although four people were hospitalized.

"With a growing interest in reactors in industry and in universities, more light must be shed on the whole question of reactor safeguards. What is the state of our knowledge and what is AEC policy? Are there any trends which might result in a change in policy with regard to location of reactors? What about the spheres that Knolls Atomic Power Laboratory and Argonne National Laboratory are building to house their reactors? Is this the key to the future? . . ."

That "key to the future" is still under lock and key at this writing. Meanwhile, a specter has risen to haunt physicists. Like the Roman god Janus, it has two faces.

Its smiling face reports that, by the year 2000, atomic energy may be supplying a large percentage of the world's energy requirements. By that time the world can be expected to consume energy at the rate of 100×10^{18} BTUs *per century*. But the earth's proved energy reserves of oil, gas and coal—reserves now located and profitably recoverable at present-day costs—are estimated at between 30 and 40×10^{18} BTUs.

Barring excessive cost advances, reserves of chemical fuels will increase as recovery processes improve, tideland oil is developed and so on. There is grave doubt, however, that those increases can keep pace with the spectacular rise expected in energy consumption. A few experts are betting on sun power to fill the gap. The "smart money" backs atomics since the breeding of large quantities of such fuels has been proved feasible.

The frowning face of our nuclear Janus says that, theoretically, there is no possible way of speeding up the half-life of any radioactive substance. If that half-life is brief, the contamination problem solves itself, as it has done so far after each atomic bomb test. If it extends over months, years, centuries and millennia, as it does in many substances, waste radiation builds up. And it is bound to build up in direct ratio to the amount of fissionables consumed. Already, for example, the Hanford production center has ten megacuries of waste in storage. If that waste somehow got into the nearby Columbia River, it would harm all marine life in the entire Pacific Ocean.

The situation at Brookhaven is even more complicated. Wastes from that pile are stored underground in steel-and-concrete vaults. Well-placed enemy bombs might scatter that long-life hot stuff over the surrounding country-

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side and allow it to seep into the water table which lies seventy to ninety feet under the surface of the earth at that point. In an effort to prepare for such a disaster, the AEC has sunk a number of wells through the shallow water table and down into the fifteen-hundred-feet-deep water-bearing Lloyd Sands strata underlying the laboratory. If the table should become contaminated, the plan is to pump its waters down into the deep strata until they run pure again.

Unfortunately, the Lloyd Sands strata come much nearer the surface at the town of Great Neck, Long Island, an hour's drive from Brookhaven. There they are tapped as a water supply source. Now, *if* contaminated Brookhaven near-surface water had to be dumped in a pinch, many centuries—perhaps a full millennium—might pass before they percolated through the Lloyd Sands to Great Neck but they would be practically as deadly as ever when they finally arrived.

In the meantime, however, the Long Island water table is dropping steadily due to heavy industrial use and other causes. It is easily conceivable that, long before the contamination reaches Great Neck, an industrial concern in search of large artesian supplies may drill into the Lloyd Sands nearer to Brookhaven and, shall we say, start making beer? Or some geological phenomenon, such as an earth tremor, may connect the water table with the Lloyd Sands.

This argument may sound academic but it already has led to the resignation of one Brookhaven physicist. He argued that men of today have an obligation to future generations. He contended that the dump wells represent uncontrolled contamination. And he pointed out that no body of law yet exists which can be enforced to regulate such hazards.

A few states, communities and other groups are beginning to face up to this growing contamination problem. At Schenectady, New York, the Mohawk River Advisory Committee has approved waste-disposal methods at the Knolls Atomic Power Lab as constituting no health or safety hazard. The California Department of Public Health has asked for an appropriation of eighteen thousand dollars to study industrial atomic hazards in that state. But, to date, the AEC projects being scattered ever more widely across the country must depend upon the judgment of their scientists regarding waste and contamination control methods.

Those scientists are backing up their judgment with intense research, of course. For example, the AEC is using one hundred twenty-one United States Weather Bureau stations, as well as a number of mobile teams, to monitor radioactive dust "fallouts" from atomic tests in Nevada. Other teams are studying the nation's rivers to de-

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termine which are best suited for use in cooling atomic piles. The two hundred sixty million dollar H-Bomb plant was located on South Carolina's Savannah River rather than on the Red River in Texas partly because the Savannah carries fewer dissolved solids that can become radioactive. Suspended silt is comparatively easy to remove from river water but dissolved solids are not. Unremoved, they carry contamination that results in such phenomena as "hot fish." The Columbia River in Washington has, unfortunately, a rather high dissolved-solid content. The AEC bars sportsmen from the river near Hanford because fish caught there have picked up much radioactivity. If one is placed on a photographic plate overnight, it leaves a clear picture of its skeleton, gills and head glands!

Such research is paying dividends. Not too long ago, for instance, it was customary to put contaminated sludges from atomic laboratories in glass jars, take them twenty-five miles or so out to sea, dump them, and pot shot them with rifles until—it was hoped—all the jars had been broken and their contents diluted.

Today, liquids are put in steel drums encased in three to six inches of concrete or are mixed with concrete and made into big balls. These are dumped beyond the continental shelf into the ooze covering the ocean bed. The four radioactive waste disposal services authorized by AEC are taking no bets as to just what, eventually, may crawl out of that ooze!

Among other scientists, Nobel Prize Winner H. J. Muller is disturbed by what may happen to human and animal genes if the contamination problem is not soon solved. This noted biologist, geneticist, author and authority on the effects of hard radiation on fruit flies has issued a number of warnings. They say flatly that radiation is "an irreversible genetic time bomb" that conceivably can doom one twentieth of the human race to eventual death through harmful mutations.

The insidious thing about this "devolution" is that it does not occur instantaneously, as the result of an atomic bomb blast. It comes so slowly that, for generations, few people might be aware of what is happening to them.

"'Out of sight, out of mind' is hardly an excuse that our descendants will readily grant to us," says Dr. Muller. "Certainly the less fortunate among them will realize acutely that, for some of these misfortunes, even though they cannot know which, we are the responsible agents. And they will blame us the more if their distant injuries had been produced rather in the cold blood of peace than in the heat of war. This stricture holds not only for those dealing with atomic energy and radioactive materials but for all other users of penetrating radiation."

There is some talk, now, of dumping

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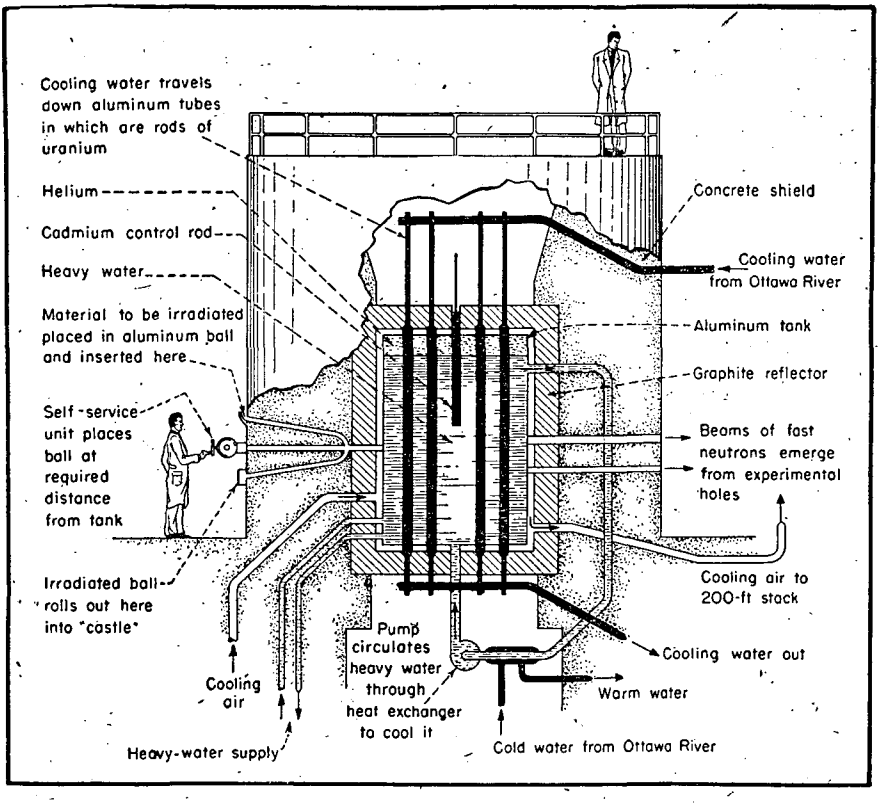
wastes into exhausted gas or oil fields thousands of feet deep. But, since many fields once thought to be done for now are being repressured with gas or water and made to flow again, and since oil-bearing strata as much as four miles down sometimes underlie abandoned shallower ones, there is no sure way of controlling such disposal.

Perhaps, as a famous scientist suggested a generation ago when he was struggling with the puzzle of what to



NRX REACTOR AT CHALK RIVER, CANADA, has 176 water-cooled aluminum tubes containing rods of natural uranium which are surrounded by a heavy water reflector contained in aluminum tank. Dismantling and examination following a breakdown in December is expected to take quite a few months. The shell of NRU, another heavy-water reactor, is going up near NRX. Among the new features for NRU are an improved mechanism for automatic control, and an arrangement for easier removal and replacement of uranium rods

Courtesy of *Nucleonics*

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do with old razor blades, our first use for the Moon will be as a dump!*

When, and if, the disposal problem is solved there will remain those other pressing matters of detecting and studying the effects of radiation, both harmful and beneficial, and of washing off and chelating—surrounding and carrying away—all wastes that can endanger personnel, irreversibly affect genes, damage equipment or throw experiments out of kilter.**

Equipment and new chemicals to help in this work are being developed so rapidly that it is almost impossible for one man to keep informed as to their characteristics. In 1952, the six-year-old radiation instrument industry did a twenty million dollar business, employed twenty-four hundred persons and still had only AEC and the military as its principal customers. Trade magazines print descriptions of thirty to forty new instruments in every issue, plus ads for a host of others.

Just at present, greatest attention is being paid to variations of the scintillation counter previously mentioned. One type, built to be towed under the new low-flying, two-propeller "chopper" helicopters, promises to give the air-borne magnetometer intense competition in the search for oil, uranium and other mineral deposits. It picks up and charts the faint halos of radiation that have been found to outline the boundaries of most oil fields. (The magnetometer charts variations in the Earth's magnetism caused by different types and shapes of underground rock strata. The best it can do is to indicate formations which *may* contain oil.) If the new technique lives up to its early promise, it may eliminate a lot of expensive exploratory drilling into formations that turn out to be dry.*

An elaborate medical scintillation detector spots and triangulates tracer isotopes introduced into the human body and lodged in disease foci. Surgeons who locate a brain tumor by this method no longer need remove the top of a patient's skull and probe about, more or less at random, in his gray matter. Shock, tissue damage and time required for operations are reduced in this way, while chances of recovery are much brighter.

Like Watchbirds, scintillation counters, as well as the less sensitive Geigers, also warn their users against

* Dumping into the Sun would be even better. As Reiss puts it: "Why louse up even a dead planet like the Moon the way we seem intent on lousing up a live one."

** The warships used in the Bikini tests were sunk, when it proved impracticable to remove the radiation they had picked up. It was feared that, if they were scrapped, that radiation might get into tools and other atomic equipment.

* Radiation counters should not be confused with the electronic metal detectors that are just coming into widespread use. The latter are being employed in marine salvage, even locating lost outboard motors and a flying boat that was swamped in deep water off the shore of one of the Great Lakes. They are, essentially, simplified radar sets that send out waves and pick up the echoes that bounce off pieces of metal, even pieces as small as rings buried three feet under the sands of Coney Island beach. Another way to tell the difference is to note that a scintillation counter costs $495 for the little pistol-grip outfit and $1,100 for the basic laboratory scaler model. Treasure hunting metal detectors can be had for under $100.

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too-close approach to any source of hard radiation. They are not too discriminating in the latter regard however. One that I tinkered with recently squawked like a startled hen when the radium dial of my wrist watch passed in front of its blunt nose. The really discriminating radioactivity detectors for persons working in laboratories and around piles are film badges that darken with exposure and fountain pen-size dosimeters.

Until a few months ago film badges reacted only to gamma and beta rays. Now one has been developed that detects neutrons as well. It uses a special photographic plate originally created to measure cosmic rays. It is so sensitive that the number of neutrons encountered can be counted by checking the tracks left on the film by the protons which those neutrons have bumped into over a given period of time.

Dosimeters are of many different types. One of the most popular is, essentially, a fine quartz fiber thread that moves across a scale fixed inside a metal tube one-half inch in diameter by some four and one-half inches long. The fiber is charged electrically by means of a flashlight battery or electrostatically by rubbing at the beginning of each exposure period. Any nearby radiation progressively discharges it. The scale can be read by pointing the end of the tube at a light source and squinting through.

Dosimeters are built with sensitivity ranges of from 200 mr (milliroentgens) for laboratory use to 100 r for civilian defense, military and other emergency operations. (Permissible radiation, says the AEC, must not exceed 7 mr per hour for forty hours a week. Any lab worker getting a larger dose takes a day off, at best, and goes to the hospital, at worst.)

Quartz fiber measuring instruments also include elaborate kits for testing water pollution and for low-level measurements in laboratories and hospitals. The latest addition is a baby dosimeter approximately two inches long and attached to a ring. This was developed when too many valuable physicists began damaging too many valuable fingers with radiation burns. This happened, due to the workings of the inverse square law, even when breast-pocket "pencils" showed permissible readings at the end of work periods. Dosimeter manufacturers now are working on an inexpensive model suitable for sale in 5 & 10 cent stores.

Despite constant improvements being made in radiation detectors; pile shielding and operation; remote control tongs, pipettes, periscopes, mirrors and other instruments; and contaminant disposal, the fact must be faced that atomic catastrophes, as well as a certain amount of tissue and gene damage, radiation sickness and unpleasant forms of disfiguration or death cannot be avoided as the world enters an uncharted atomic age. The problem is to keep the harmful effects

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from getting out of hand, as fires and highway accidents have done in the age of chemicals. (The United States had thirty-seven thousand six hundred traffic deaths in 1952 alone, while fire caused one hundred thousand deaths and destroyed three-quarters of a billion dollars' worth of property.)

When the lawmakers finally get around to facing their responsibilities in this matter they will have a large body of information to use for guidance. Some of the best medical brains in the country are working overtime to find out just what radiation does to the human body. They hope this research will give them clues to substances or techniques that can be used to minimize harmful effects.

Physicists at the University of Saskatchewan have, for example, made an extensive study of one hundred twenty-five cancer patients being treated with a 24-Mev betatron. They report that, since treatments started in 1949, no patient has shown any harmful biological effects.

Experiments made at North Carolina State College to determine the radiation tolerance of Habrobracon wasps showed that, for some mysterious reason, the lethal dose of radiation for these adult insects is more than one hundred times that for a man —or a mouse. They also disclosed that heavy doses of radiation seem to increase the wasps' life span in just about the same proportion that it decreases their fertility and does irreversible damage to their offspring. Leave it to the extrapolators to decide whether this hints that Atomic Age Man will live longer than we do but be punier and have fewer children, or whether it points to a survival-of-the-fittest struggle with our chitinogenous neighbors.

Partial protection of rats from radiation damage through administration of linoleic acid, a chemical found in fats, was achieved recently at the University of Southern California. In research aided by the Atomic Energy Commission, it was determined that rats given a small daily dose of the acid lived seventy-four days after exposure. Undosed animals lived only fifty-three days.

Typhoid and tetanus immunization "shots" may give humans considerable protection against A-Bomb radiation, physicists and physicians of the University of California and the Los Angeles Atomic Energy Project have found. Apparently the "shots" increase the number and activity of macrophages, those defender cells that attack bacteria invading the body. This tends to offset the depressing and demoralizing effects of radiation on the macrophages. They are enabled to continue protecting the body from those "complications" to which radiation victims tend to succumb.

When all is said and done, however, one of the leading protective agents turns out to be our old friend ethylene

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diamine tetra acetic acid. Used externally as a detergent, EDTA removes practically all contamination from skin, clothing and laboratory equipment. Alongside a somewhat similar phosphorus-containing compound, it plays a big role in decontaminating piles, such as that at Chalk River, where floors and walls may have been sprayed with radiation.

Also it has just been learned that, taken internally, EDTA actually washes a large percentage of harmful contamination right out of animal tissues. It does this even after the contaminants have had time to deposit themselves in the skeleton.

The tip-off on this unique ability of EDTA may have come from AEC-sponsored research at the Neoplastic Division of Montifiore Hospital in New York's Bronx. There it was found that the substance effectively removed painful calcium deposits from arthritic bones.

So far as is known, human victims of contamination have not yet been treated with EDTA although at least one case of acute lead poisoning showed great clinical improvement after undergoing such therapy. Preliminary tests at the United States Naval Radiological Defense Laboratory in San Francisco and elsewhere on rats injected with Yttrium-91 and other long half-life isotopes produced in quantity by nuclear fission, have shown highly promising results, however.

One such test showed that, if sodium-EDTA and calcium-EDTA were administered *before* injection of Y-91, treated rats excreted ninety-three per cent of the isotope with their urine and suffered practically no tissue damage. Untreated control rats could get rid of only twenty-five per cent of the isotope.

A second experiment started dosage one hour *after* the Y-91 injection. Treated rats eliminated eighty per cent. Even when treatment was delayed for much longer periods, the animals receiving EDTA compounds fared far better than the controls. Most of the harmful nuclides that had become fixed in the bones were excreted and replaced with healthy calcium.

All of which indicates that the atomic age may have its own nauseating nostrums but that it need not be so frightening as it has been painted in some pessimistic quarters. If the worst comes—that is, if the problem of contamination disposal is not solved and background radiation keeps creeping up—folks of a few centuries hence may all have to carry dosimeters and scrub themselves inside *and* out, like milk bottles, at frequent intervals. But inexpensive power from nuclear fission or fusion, plus the longer, healthier lives promised by tagged-atom medical advances, should make those annoyances a small price to pay for progress.

THE END

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TO BUILD A ROBOT BRAIN

BY MURRAY LEINSTER

The technician *will use the tools, and assemble the parts. Before that, the physicist-engineer will design the parts. But even before that, the philosopher has to design the concept!*

Not too long ago a man I'll call Casey got scared nearly to death by a thinking machine. This is not fiction, you understand. This is honest-to-Hannah fact. You'd recognize the name of the machine if I told you. It's one of the big computers with an all-capital-letter name like a government agency in Washington. It is a honey of a device, with some thousands of vacuum tubes, relays, special devices to prepare tape for it to read, and an electric typewriter to type out its answers. It handles letters as well as numbers, and you can feed it lists of names, for example, and it will sort them out alphabetically and make its answer-typewriter write them out in proper sequence. Also it calculates ballistic data and how to make wings for jet planes, and tabulates percentages on presidential elections, and little things like that.

But it nearly scared Casey to death.

It was two o'clock in the morning and the machine was running silently as usual. The whole building in which it is set up was empty of people. Maybe a watchman or two on other floors, but nobody except Casey right here on the job. Light bulbs glowed at one spot and another, with plenty of darkness in between.

The thinking machine didn't even hum. There was no sign of activity anywhere about it, except small indicator-lights on the monitor panel, which turned on and off in a sort of meditative fashion. The spool of metal tape feeding to the computer was turning slowly. Now and again it paused in its movement. That was when the memory-banks were being consulted for instructions or memory-data. At such moments the machine was doing exactly what a man does

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when he scratches his head.

Casey—and I repeat that this is history, not fiction—leaned back in his comfortable chair. There was a two-spool problem being run through. Somebody else had prepared the tape. Casey was simply there. He hadn't a thing to do. So, on stand-by watch over the most intellectual machine in creation, Casey was reading a comic book.

Suddenly there was an uproar. Against all precedent, the electric output typewriter was clicking furiously before the problem was solved. A loud-speaker made a din. The thinking machine was working the typewriter and had turned on the loud-speaker alarm to call Casey on the run. He got to the typewriter in a hurry. Its keys still clicked. They stopped, indignantly, as he read:

"Casey, you blank-blanked son-of-a-so-and-so, you forgot to change the spool to Number Two!"

Casey's hair stood on end and he wanted to run. He thought for a moment that the machine had come alive on him and was bawling him out.

Two seconds later he was hopping mad, of course. As soon as he thought, he knew what had happened. The man who'd prepared the two spools of tape had known Casey would run the problem through. So, at the end of the first spool of tape he'd zestfully included instructions for the machine to blast the loud-speaker and type that abuse to Casey, before the normal signal for change-of-spools came along. When those instructions-on-tape took effect, Casey's tranquil ease was shattered.

For a moment, though, it had seemed even to Casey that the machine had a personality and reactions of its own. It hadn't. But most of us are inclined to think that machines have minds of their own, and practically all of us expect that presently we will have actually thinking machines. As of now, the people who handle this machine say that it can only do half of the things a human brain can do—remember, recall, associate these instructions with that action, integrate numerals, and so on. Half of what a human mind can do is rather remarkable, but Casey's fellow-workers tend to restrict the use of the word "thinking" to the things an electronic computer cannot do.

Still, what with the progress of science and all, most of us assume that presently we'll have robots to do all the heavy labor of the world. Perhaps the most eagerly awaited robots are robot minds to do that especially heavy labor known as thought. But up to now nobody seems to have estimated the problems to be faced in designing a truly thinking machine. Not in print, at any rate. The basic principles for the operation of robot minds do not seem to have been stated.

Here goes.

It looks rather promising at the beginning. A baby starts out with a

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mind that is blank of information and ideas. It receives sense-perceptions of this and that. After some tens of thousands of days, during which its eyes and ears and fingers and sensory equipment generally feed data to it, the formerly blank mind has a reasonably coherent idea of the universe around it. In fact, a baby starts out as a potential rational animal, and with nothing but constant information to help, winds up an adult with occasional flashes of reasonableness.

A thinking machine should be able to duplicate that, with greater ease and more efficiency. A machine that is to think about science doesn't need all the data a human needs for living. A machine doesn't need to know what will happen if it drinks boiler-makers, because it won't drink. It needn't know the difference between Republicans or Democrats. It won't vote. A great deal of painfully learned information can be skipped by a machine which has no gender. So a robot's brain can work to splendid advantage with only the education needed for its specialty.

We don't have to duplicate human interests to make a useful machine. It has to be able to take in information—the computer just referred to does that, and so does a human baby—and make use of it. The computer that scared Casey takes its information from dots of magnetism on a metal tape. It would seem that if one feeds specialized information to a thinking machine—a robot brain—with specialized interests, it should reason merrily away. A computer is "interested" only in numerals and letters. Make a brain to handle other thoughts, and it should reason with a speed and precision no man could duplicate. Given a process for thinking instead of computation, it seems that we should be able to make a high-speed, high-precision, brilliant brain.

The process for thinking looks practical enough. With symbolic logic one can reduce any problem to graphic statement and the processes of logic are beautifully adaptable to robot operations.

Take a routine logical operation. "James is a man. A man is a rational animal. Therefore James is a rational animal."

Put symbolically, it reads:

J) M
M) RA

That's the problem only: "The idea 'James' implies or includes the idea 'Man.' The idea 'Man' implies or includes the idea 'Rational Animal.'" Such a problem can be fed to a perfectly practical machine-brain, it will cancel the identical terms, and come up with:

J) ~~M~~
~~M~~) RA

J) RA

"The idea 'James' implies or includes the idea 'Rational Animal.'" In short, James is a rational animal. Nothing could be clearer, and Aristotle

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himself couldn't do better. It is certainly within the capacity of a machine to do. We could use numbers instead of letters, to stand for our terms, like a sort of algebra used hind-end-foremost. So:

Let 5 = James
6 = Man
7 = Rational Animal.

We get:

$$\begin{array}{r} 5)\not{6} \\ \not{6})7 \\ \hline 5)7 \end{array}$$

Here numerals—familiarly used in machines—are used in a mechanical duplication of thought. It works. Obviously, a machine can be made to perform logical operations—which is to say to think.

You might contemplate this lovely set-up for a while. If you care to gloat over it, go ahead. Have your fun. But there is a slight objection that can be raised, which ultimately produces a small chilly sensation in the mid-section of one's enthusiasm. This is a thinking process that a machine can perform. But it does not necessarily give a right answer under normal operating conditions with a man working the machine.

Mr. Will Durant exemplifies the catch in his book, "The Story of Philosophy." His raising of the point will do as well as any. Using the same logical process, only with the name of "Socrates" instead of "James," he arrives at the same result: "Socrates is a rational animal." But then he triumphantly points out that this particular Socrates might be insane, in which case no logic would make him rational.

The objection is not quite bright, of course. When we say that James or Socrates is a man, and that a man is a rational animal, we use the term "man" with the same value in both statements. We reassert the equality of meaning when we let the two cancel out. Only equal things can cancel, mathematically or logically or otherwise. Mr. Durant didn't think of that. His argument would be expressed by somebody using the numerical expression above, with 5s and 6s and 7s, and then crying gleefully: "April Fool! One of those sixes wasn't a six, but only five and seven-eighths! So your system of thinking doesn't work!" It is a way of saying that a method is wrong if it isn't proof against cheating. I think one can drop the objection—*qua* objection—into the wastebasket.

But one cannot dismiss the objection that if a robot brain has to depend on the honesty or the reasonableness of the human who gives it information, then the answers are going to depend on the man and not the machine. This is true of mathematical computers, but people do not have opinions about numbers. They are neither dishonest nor unreasonable when they ask for the result of the integration of numerals. But they do cheat when they ask questions about

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matters of more general interest—which is exactly what we want a thinking machine, a robot brain, to be able to answer.

A thinking machine has a highly special requirement for utility. It has to have sense. It has to be presented with the problem, not merely with symbols plus instructions to do such-and-such with them. That is where a computer falls short of being a thinking machine. It does not do anything better or more brilliantly than a human brain. It simply and exclusively does it faster. But a real robot brain will need to be smarter than mere men, or there's no point in making one.

To dodge the difficulty of depending on a man to tell it what to do and what with, a true thinking machine needs to understand a problem presented to it, so that it can tell whether it has adequate data for a solution. Make a machine that can tell when it needs information, and what kind, and that means that you have at least a rudimentary thinker right away.

But if it depends on men to provide it with information it will be slow! And also it will accept any data given it. It can hardly tell that a man *says* six when the fact is five and seven-eighths. So such a machine will be slow and also no more accurate in its answers than the man-provided information. For accuracy alone—not to mention speed—a useful robot brain will need to hunt up the information to solve any problem presented to it. The only useful kind of robot brain will accept a problem, devise its own method of solution, seek out the data needed for the solution, and then produce the answer.

And in theory, at this point, that looks possible. A robot brain could use photocells for eyes, microphones for ears, and all sorts of artificial sensory organs to gather information. As a matter of fact, our most accurate information comes from artificial sensory devices. Microscopes are sharper than eyes and microphones than ears. Spectroscopes can gather information our senses balk at, calipers make measurements we can't approach, and in case of need a robot brain might use an electron microscope to get accurate information otherwise unobtainable.

A robot brain could, then, have information of a much higher degree of accuracy than we humans usually obtain. Its information would not be slanted by prejudice, distorted by personal errors of observation, or tied in knots by emotional associations. A robot brain that gathers its own information should be vastly better-informed than any man could possibly be. It should think with strictly accurate logical processes. It should think sounder, faster, more sanely. A robot brain like this is exactly what we want—and do we need it!

But I suggest a slight pause here for deflation announcement.

The process outlined here for a ro-

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bot mind is exactly the way a human mind works—as far as it goes. But something new has been subtracted. It just happens to be the fact that one can know the shape of a thing, and how big it is, and what it's made of, and its color and the way its atoms link together—and still not have the ghost of a notion what it happens to be or do. One can know everything about an object that the most acute imaginable senses can tell us, and know no more about it than a baby. Which is the point. After the first few months a baby's eyes are fairly good. It sees things clearly, but it doesn't know what they are. Its eyes don't tell that. Its mind has to do that job.

Well . . . we're working on a mind.

I went to an auction some time ago to bid on some books because there was a copy of Parson Weems' "Life of George Washington" in one lot. (I got the book, and it's ghastly. I do not believe the cherry-tree story.) The auctioneer put up a small varnished box and pulled a brass object out of it. I bought it out of curiosity, for a quarter. Nobody knew what it was. It was brass and it was made to do something, but it was completely cryptic, and the printed instructions were in some completely unknown language. Now, the thing had no telescope or plumb-bob or degree-circle or anything resembling any of those things. And I'd never heard of such an instrument, but I made up my mind that it was a sort of eccentric, patented, impractical device for running levels for ditches. Eventually I found somebody who could read the directions. They were Swedish, and I'd guessed right. I'm very vain of that achievement, though I haven't the least use for the gadget.

Now, how the devil would a thinking machine work out a problem like that?

How do we work out such problems? We do, and by a very simple system. We know that a hammer is made to hit, a saw to saw, a knife to cut, a boat to sail, a gun to shoot, and so on. When a new object comes to our attention we look for its purpose, its function, its use—what a philosopher would call its "act." We know we don't know what a thing is until we know what it does. When we can build that conscious ignorance into a robot mind, it will look for the same things a baby's mind looks for, and accomplish probably more.

It's worth thinking over. It's quite a simple problem, after all. We can make a machine that will inspect something and learn and record that it is a one-inch-in-diameter thing, an iron thing, a round thing, a flat thing, and a pierced thing—that it has a hole in it. It's a round, iron, flat, pierced, one-inch object. The machine can discover and apply all those adjectives to it. But it can't discover a verb or a noun so it can make a really intelligent statement about it.

A human being, looking at that ob-

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ject, will discover that it can go under the nut of a bolt to spread the pressure when the nut is tightened. That's the verb. The noun follows. It's a washer.

The key to a robot mind's construction would seem to be simply the discovery and/or recording of the equivalent of verbs and nouns so the robot can know what a thing is by what it does—or of course the other way about. If we make a machine to do that very simple little trick, performed by human babies the first time they grab for a bottle, we can add as much to the effective intelligence at our disposal, as computers have added to our ability to do sums.

Such a trivial thing! But if you want to acquire a really fine case of pure intellectual frustration, just work on it a while. Just try to invent a way to key a machine so it will recognize what a thing is, and never miss what it is, and never mistake it for something else. Accomplish that very minor feat, and all generations henceforth will revere you. You will have cracked the problem whose solution will give us thinking machines. A machine which can do that will think straighter than a man—and if it can't do that it can't think. But it seems that it ought to be so easy!

The difficulty is as idiotically simple as the thing to be done. Think, say, of a boat. When you do, a picture comes into your mind. Maybe your picture is of a Star Class racer. (Mine is.) But an outboard motor is a boat too, and so is a sea-sled and a canoe and a wind-up toy and a chip with a mast and a note-paper sail and the liner *United States* and a destroyer and a catamaran and a pirogue. Upon Lake Titicaca in the Andes they make boats out of bundles of straw. They're all boats. But there is not a single thing about them—as objects, aside from what they do—which is applicable to describe all of them and which a mechanical device can detect or record.

One more. You know what a timepiece is. A clock is a timepiece. So is a wrist watch and a grandfather's clock, and a time-clock in a factory. But also a sundial is a timepiece, and an hour-glass and a clepsydra—water-clock—and a chronograph and the ammonia clocks that have no moving mechanical parts-and are the most accurate timepieces we possess. Even the Carbon 14 in organic matter makes any organic object a timepiece of sorts!

Name a means by which any possible device, examining a Nuremburg egg, would identify it as a pocket-watch and therefore in the class of timepieces along with alarm clocks, sundials, sextants—which in one use determines the local time—and a wax taper of King Alfred's time with hours and quarter-hours marked on it, to tell the time by its rate of burning!

Looked at that way, it appears that thinking is simply impossible, not only for a robot mind, but for a human one. But we do think. We can

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identify things with ideas. The process, even, is perfectly clear. It's simply one that nobody has been able to duplicate. If you work on it, you may hit the jackpot.

It works like this: When I think "timepiece," a picture comes into my mind. It is not exactly a clock, and it's rather fuzzy, but in my individual case it does have a clock-face. It is not the idea of a timepiece, however, but simply a sort of filing-envelope to contain the idea of a timepiece for use. When I want to think about timepieces I drag that out and use the idea—not that picture—in my thinking. In the same way, when I think of "water," I usually think of water as contained in a glass. I use "glass-of-water" as a file-clue; as an index-symbol, as a container for the idea of water, without pretending for an instant that it is actually what I think water really is. In the same way I'm apt to think of a bluebird when I think of happiness, because it's a good, symbolic container for an idea. It suffices to hold the idea for use. But I know a clock-face is not essential to a timepiece, or a glass to water, and since I happen to live in the country, any day all summer I can go outdoors and see bluebirds fighting like hell on the lawn. (But, of course, that may be their idea of happiness.)

I'm trying to establish that the idea of a thing—the notion of what something really is; the thingumbob that we use in thinking about things and that a robot mind needs to be able to handle—is not itself a picture. We can store ideas in pictures for convenience, but we know that the containers aren't the things. And that's the trouble! A robot mind or a thinking machine is going to have to handle knowledge of what things are, if only because it has to take account of what they do. At its baldest, simplest, barest statement—how could you write down the idea of anything at all? How could you note down the idea "food" so a machine could identify a substance as food? How, again, would you arrange them to be hunted for in the robot's mind? (Don't ask me how we associate ideas! Or find them! But just for simplicity's sake . . .) If we knew that ideas range through this variation in size or shape or weight or volume, or if we could detect something about two ideas that a mechanical or electronic device could detect so it could distinguish between them . . . well . . . we might get started. Maybe you can work something out. But as of now nobody seems able to detect anything about ideas at all. There is definite evidence that they exist, of course. We know them and live with them and dream them and think with them every second we're alive. But what kind of gizmo is an idea, anyhow?

There are some very definite details

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—mostly of what they aren't and do not contain or possess. For one thing, an idea does not contain anything that—as a matter of perception by our senses—we have seen or heard or felt or tasted or smelled. But ideas are contained in things we see and notice—even such unsubstantial things as magnetic fields. And ideas do not contain specifications of material, but they may be contained in specific material. A ball is an idea, and we can find that idea in round objects of any imaginable solid or liquid, and even some stars are said to be mere balls of gas. An idea does not contain a design, though it can be contained in designs. The idea of a house or a cabin cruiser doesn't include the idea of a blueprint, to most of us, but anybody can see the idea of a house or cruiser in a blueprint. Perhaps the most baffling of all the facts about ideas considered as things is that they do not even seem to have any parts. Each idea is simply itself. Which is an item you can check with your inner consciousness.

With these rather depressing details to go on, it's clear why we have trouble imagining a robot mind—a mechanical or electronic device—to deal with ideas. We can imagine the robot mind, all right. But all imagining is simply a shuffling and reshuffling of things we have in some fashion perceived. If we haven't perceived something with our senses, in one way or another, we can't imagine it. Thus, a blind man who has never seen light can't imagine it. He can think about it, but not have a picture of it. In the same way we can think about ideas, but we can't picture them. So when we try to think about a robot brain to handle ideas, we are trying to imagine something we *can* imagine, dealing with things we *can't* imagine.

Naturally, we have some trouble with the details. But it is certainly possible in theory that somebody might concoct some gadget to perform with ideas what can be done with numbers.

After all, ideas are realities. They have effects, and unreal things do not produce effects. Ideas not only produce passes at girls who even wear glasses, but cities, wars, and streptomycin packaged ready for use. Nations exist because of them, statues are carved because of ideas. This magazine, as a matter of fact, is printed for the express purpose of giving you perceptions from which you can abstract ideas. And while it is true that ideas are fundamentally in the universe around us, ideas are formally and specifically in our minds. They exist in a certain place—my ideas are in my skull, and your ideas are in your skull—and they have effects, but they haven't any dimensions or any inside or outside, and they are utterly different from each other. To cut down the discovery needed to make a robot brain possible, you

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can say quite truthfully that the basic need for a thinking machine is simply some way by which it can tell one idea from another.

We do it all the time. It must be quite simple, if only one can get the right approach. All through this article I have been tackling the problems of a robot mind by comparing the needed process with the observed operation of a human mind. The system doesn't work so well when one gets this far. But it could be changed a bit and tried further. Maybe the approach to understanding how a machine could be made to think would be possible if one understood how an animal which could not think became capable of it. I suggest that a machine, right now, can do just about everything an animal's brain can do. We can make machines to perceive, to recall, and even to scramble recollections and arrive at imagination akin to dreaming —and no more packed with sense. We can make mechanical devices which actually learn by experience and acquire rudimentary conditioned reflexes.

We humans are animals, in a sense. Only we can think, which is all the difference anybody needs. It might be that one could get a clue to building a robot mind if he worked out the process by which—to be respectable one has to say by evolution—an animal's brain became capable of ideas, as it has done in our case. It is a singularly isolated phenomenon. There are hundreds of thousands of other species of creatures on Earth, but we are the only one capable of thinking in terms of ideas. If there were another creature capable of it, we'd have some keen competition.

The difference between our brains and those of other higher creatures is much more of function than of structure. If you can work out the difference in operation, you may make robot minds immediately possible and deserve well of your fellow-citizens.

If the direct approach, of seeking to understand how we happen to be human, does not yield results, you might try still one more. You might try to figure out why we are human.

There is only one theory that I know of. It does not offer a solution to the technical problem of making a robot brain, but it is pretty plausible.

You learned it in Sunday School.

THE END

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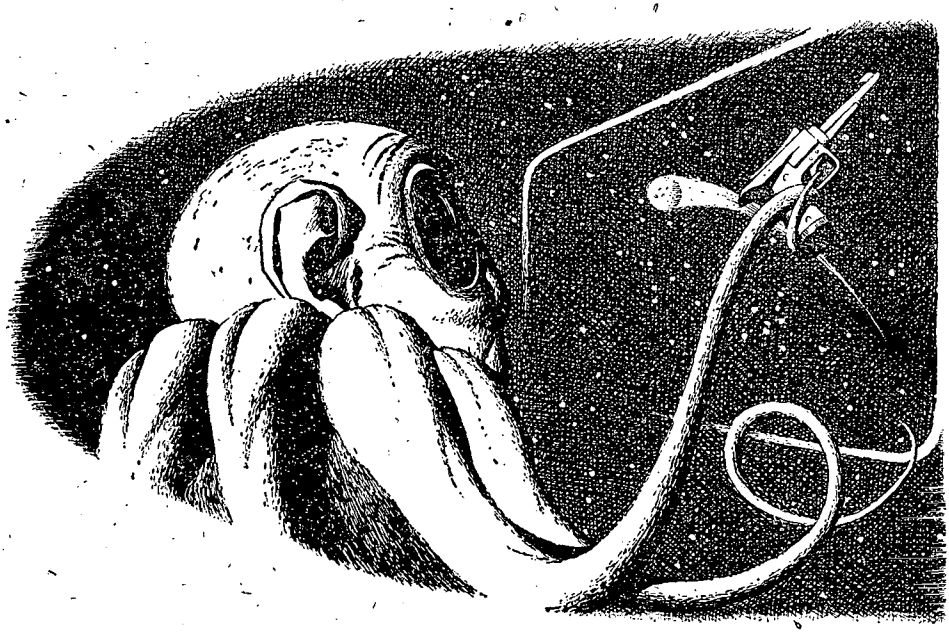

THE THOUSANDTH YEAR

The great trouble with logic is that it's as weak as its weakest link—not as strong as its strongest. A logical civilization is deadly and unhappiness is an extremely weak link to build on!

BY ROBERT ABERNATHY

The trap was ready to be sprung. Ratk warships, grim with black armor, astare with guns, swung lightless and almost indetectable in a hundred orbits around the G_0 sun. Tense-nerved technicians watched the indicators of electromagnetic and gravitic instruments that registered and plotted continuously the course of the approaching enemy ship.

And at the expeditionary force's base on the second planet, behind the

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Illustrated by van Dongen

most formidable fortifications and batteries which it had been possible to set up in four years' feverish effort, waited more thousands of Ratk. It was their duty to put up a desperate last-ditch fight in the unlikely but not inconceivable event that the enemy's vessel's unknown armaments should prove sufficient to overcome a hundred battle cruisers.

In the chartroom of his flagship the Great Ratk rested, sagging grossly in the commander's chair. The weightlessness of orbital flight made his cervical tentacles drift round him like curls of smoke, but the sucker-feet on his underbody held him securely in his place. Screens before and above him reflected the diamonded blackness of leeward space.

"Give me the gravitometer readings again," commanded the Great Ratk heavily.

The Second Greatest, the younger Aglur, read off the figures from the board he was keeping watch on. The Great Ratk Dumur—who had in anticipation been over and over the situation now unfolding, until its reality seemed to him like a recurrent dream—needed no more than the bare gravitometer data to assure himself that the enemy was still approaching under constant deceleration, still cutting down the small fraction that remained of the terrific velocity which

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had brought him here out of unknown interstellar distances. There was no need for any change in the plan of ambush.

The younger Aglur added gratuitously, "The shape of the mass-diminution curve has been plotted now to the point where we can estimate the enemy's rest-mass within a few tons—"

"I know!" the Great Ratk said irritably. "Keep your eye on the board, and inform me instantly there is any course change."

The Great One had no doubt that this Aglur chafed—as indeed any properly green-blooded Ratk would—beneath the title of Second Greatest. Aglur would be waiting only for the present mission's completion to poison his sole remaining superior and assume command. Then the lieutenant could return home as admiral and be feted with the greatest victory celebration in a thousand years of glorious Ratk history.

But, the Great Ratk told himself, they would see about that. He might be aging, and he had been too occupied of late with his responsibilities as commander to devote much time to the usual precautions of intrigue and counter-intrigue; but his wits were still sharp. In his time he had managed to poison the elder Aglur, this one's part-parent, and a good many others who had stood in the way of Dumur's advancement in the service. And he had had a full share of victory celebrations, after the conflict with the Svi, for instance.

It was not, he assured himself, that his attitude toward young Aglur was tainted by any petty rancor. If he had caught his lieutenant in the slightest infringement of the articles of war, he would have had him executed on the spot, as the despotic authority of his office would entitle him to do. But of course Aglur was far too clever to be caught in any such missteps; and, for the rest, the Great One naturally approved of the spirit of competition and the qualities of ambition and ingenuity which it fostered. Without those qualities, the race of the Ratk might be—horrible to imagine—ready to fall easy prey to the aliens whose vessel was hurtling toward them now.

Dumur snapped a tentacle peremptorily at another of his officers, who hastened to switch on the battle chart with its medley of moving lights indicating the disposition of the fleet units. The familiar pattern of deployment for an englobement maneuver was soothing and reassuring.

He had need of reassurance. The moment of contact, now not far off, would be critical as no moment had been since the primordial Ratk had crawled out of the swamps. Never before had they faced a foe so totally unknown, yet paradoxically known for so long.

For a thousand years they had known. A thousand years, since first the instruments of a Ratk ship in in-

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terstellar space had betrayed the proximity of another mass that was also moving at close to light-velocity, an object that could only be another vessel, registering briefly while it passed a few billion miles away, lost from ken as the indicators settled back to zero and the mass-compasses swung idly again, defeated by the immensity of space.

From that moment of revelation the Ratk had begun to prepare. It was an appalling task they set themselves, to organize for war an interstellar empire that embraced 4 x 10^{20} cubic miles—when communications limited by the speed of light took years or decades to travel from one outpost to the next, when the logistics of defense and attack must be worked out in terms of generations of effort going into a single manuever, when an assault upon the empire's flank could not become known to the central command for two or three hundred years. But the Ratk planners faced those staggering problems with the grim realization that they *must* solve them, for upon the solution would ultimately hinge the control of the galaxy. Never for a moment had they deluded themselves that the enemy had not made the discovery at the same time as themselves, or that they had any advantage over him save such as unremitting determination and attention to every smallest detail might give them.

Now, after a thousand years, the labor of those generations of strategists was paying off. At a time when the present Great Ratk was still a new-spawned infant, two outlying observation-posts detected the immense mass of a body moving close to limiting velocity. They beamed their findings to garrisons farther back from the periphery, where for the first time separate observations could be correlated to obtain a reliable determination of an enemy vessel's line of flight. Then it was possible—with the margin of time gained by the slight advantage of the speed of radio messages over that of the enemy ship—to launch an interception fleet toward the hitherto unoccupied star system for which that ship was evidently making.

The problem was similar to that which would be presented by trying to intercept a hostile aircraft traveling at almost the speed of sound, with no better means of alerting the defense network than by relaying shouted warnings—but the problem had been solved. The fleet commanded by Dumur had reached the G_0 sun with almost four years' lead on the enemy—four years they had spent in panting preparation, constructing fortifications, sinking mines, building factories on the second planet to turn out more ships and armaments, toward the day that was now come.

Aglur spoke up again: "Great One, the outer stations report that they think they can pick up a visual image."

"Very well—tell them to try." The

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Great Ratk relaxed his sucker-feet and floated toward the still-blank telescreen beyond the battle chart. Outwardly he was impassive as befitted a veteran, but inwardly he was aflame with eagerness and with impatience as the screen lighted and at first showed only swimming glimpses of stars and fitfully shifting images.

For a thousand years, the enemy had been the trembling of the indicator-needle, a little irregularity in the curves on a graph, vague blotches appearing and fading on a long-range detector screen—no more. Such instrument-sightings had been numerous enough to be maddening. Ships passed in the tremendous night of space, at peak velocities of interstellar flight where any thought of matching speeds and making contact—when even a slight course change would make fuel reserves melt away—was out of the question. Faithfully the observation posts on the scattered planets reported the passage of the enemy, as watchers on a fog-bound islet might note the ripples on the beach caused by a cruiser's wake, and their reports, reaching the Ratk strong points years afterward, were helplessly filed with the rest of the growing, but still inadequate, body of information about the enemy. Enough data had accumulated to indicate that the volume of space in which the enemy was operating bordered on the Ratk empire on a front of hundreds of light-years, in fact probably overlapped the empire to some extent—space was too vast, and the suns too many, for the Ratk actually to have occupied, or policed, more than a fraction of the systems within their periphery.

Now, at long last, the enemy would be seen. Dumur stared tensely at the screen.

The relayed picture steadied, resolved. A field of stars—and, almost lost in the midst of the starry blackness, seeming to hang motionless there, the tiny image of a ship, a white globe like a perfect seed pearl lying on black velvet. It had no features visible as yet at the limits of magnification. It was so remote, so insignificant, that the sight of it gave a sense of anticlimax. But it was plainly a ship of a design such as the Ratk had never built.

"It's real," said Aglur on a hissing breath. "There's no more doubt."

"There was no doubt before!" the Great One said snappishly.

"Still, one could hardly help wondering if we'd been deceived by some unknown natural phenomenon, or if—"

"There *have* been cases where movements of our own ships were erroneously reported as sightings of the enemy. But this time there is no mistake—as even a fool can plainly see. Be quiet and let me think!"

Somehow Dumur found his subordinate more and more insufferable. Si-

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lently he promised himself an indulgence: once this was over, supposing both of them survived, he would engage some reliable hired assassins to rid him of Aglur. It was not the correct thing to do, of course; it would sit heavy on his conscience; but one as old and responsibility-laden as Dumur, with so many years of strenuous service behind him, could surely excuse himself a slight lapse from the competitive code.

His mind, freed by that resolution, came back to the more important decision that confronted him now. It was up to him, as commander on the spot, to choose between two possible tactics—whether to blast the enemy ship at once with heavy weapons in an effort to wreck it and wipe out its crew, or whether to attempt to come to close quarters, risking heavy losses and the possibility that its crew might destroy it with all the information it contained. Information was the chief stake—he could decide to be satisfied with what could be learned from a shattered and scattered wreck, or he could gamble on the hope of capturing a fairly intact vessel, which might contain charts, data of inestimable value, clues to the enemy's science, even living crew members who could be questioned.

Dumur stared burningly at the quivering little image on the screen. As yet it yielded him no hint of the procedure he should select, no way of knowing what weapons it might unleash when the Ratk fleet surrounded it. But they would soon find out. Dumur tore himself away from the screen, turned to review his orders for the englobement operation. Consulting the latest recorded data on the enemy's course, he taped a few minor corrections in the attack plan, for last-minute broadcast when the fleet should break silence and move in.

Piet and Fransi had gone into a sunward observation-turret for a long look at the star ahead. Most of the other colonists—being sensible folk, as colonists should be—had stayed to watch the big screens which, by magnification, actually gave a closer view. But there was something about seeing their home-to-be, knowing that only a bubble of thick glass—and a billion miles or so of airless space—divided them from its reality.

They stood for a time in silence, arms about one another, looking out at the immense star-powdered dark and the one light that burned far brighter than the rest and seemed to brighten still more as they gazed.

"It looks familiar," said Fransi in a hushed voice. "Sun-colored. Just like our own sun, back home."

She didn't mean the sun of Earth, of course; both she and Piet had been born on a third-stage colonial planet, and now they were about to become fourth-stage colonists. They had never met before the expedition began—a fact which sometimes struck them as

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incredible, now.

Piet said, yielding to the irresistible informative urge of the male, "Of course it's sun-colored, or we wouldn't be going there. If the calculations are right, there should be at least one planet where we and our children can live under natural conditions. You mustn't think 'back home' any more. That's home now, up ahead."

"Yes . . . the rest of our lives—"

Piet eyed her sidelong, gauging the solemnity of her expression, then cut her mood short by circling her waist with his hands and swinging her off the floor. As she squeaked protest, he growled in mock surprise, "You know, woman, you've lost a lot of weight since I married you!"

"I haven't!" Fransi denied breathlessly.

"'Struth. You're wasting away to nothing. When the captain married us at peak of flight, you'd have tipped a normal set of scales at better than a quintillion tons."

"It didn't show." Fransi looked down at her trim figure with a touch of complacency.

"Not subjectively, of course. Women—always subjective. Likewise, by the rest of the Universe's objective time, we've been married about a hundred years, so we ought to be celebrating our plutonium anniversary or something."

"Remarks like that should be grounds for divorce."

"Ah, but there's where I have you in my clutches. You forgot that ship captains can perform weddings, but they can't grant divorces."

"Trapped!" sighed Fransi happily.

They kissed, the stars forgotten.

Piet half turned to gaze once more at the sun ahead. He began soberly, "Whatever happens—" and hesitated.

"Whatever—?"

"I was only going to say—whatever happens to us now, it's been worth it." Piet took a deep breath and went on, a little too positively: "It's highly unlikely there are any serious dangers waiting for us. With a new world you can never be sure, of course, but don't worry, darling, some day we'll be revered Old Settlers, boring our grandchildren with our stories of the First Landing. Now, do you want to press your nose against the window and admire the new homestead some more, or shall we wander back to the others?"

"Let's wander," said Fransi quietly. "Maybe they've brought the planets onto the screens by now."

They made their way back to one of the common rooms near the great globe's center. Here the prospective colonists were assembled, watching the vision screen and listening avidly to the occasional comments that came through the speakers from the active crew in the central control room.

Neither Piet, as a psychotechnician in charge of the colonizing expedition's mental well-being, nor Fransi in her vocation of nutritional expert, had

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any assigned tasks in connection with the approach and landing. They sat down unobtrusively among the rest.

On the big screen the image of a planet flashed into being, swelling as the focus was improved and the magnification stepped up. It was a mottled blue-green globe, with whitish patches that might be either clouds or deserts.

"That looks promising," said Piet softly. "If it's not too close to the sun, or too far—"

Fransi stole a look round. The colonists' faces reflected wonder, anxiety, impatience—but mostly hope. Lovers clasped hands and drank in wide-eyed their first glimpse of the world to which all their dreams might henceforward be anchored. A woman held a child aloft and crooned to it urgently, "Look, look!"

A voice boomed from the speakers; they recognized the deep tones of Captain Thorn himself, saying matter-of-factly but with a note of repressed excitement: "You are now viewing the second planet. Diameter seven thousand miles, distance from sun about 1.2 astronomical units. Period of rotation not yet determined, but we'll have an estimate shortly. Evidences of water and vegetation—" The captain broke off with peculiar abruptness; from the speaker came indistinct mutterings of a colloquy in the control room. Piet pricked up his ears in a futile effort to catch what was said; Fransi was listening to the murmur of conversation among the colonists.

". . . Almost exactly as they say Earth—"

"Looks as if we're the lucky ones. We'll live off the fat of the land!"

"There will be plenty of hard work on that land—"

"I know, but—"

The speaker rumbled—the captain's voice again: "Attention, everybody. The astronomers have just spotted certain features on the second planet which may be signs of intelligent life. Making more observations now; we'll let you know what develops."

Piet's forehead creased in a vertical frown. He stood up, said irresolutely, "Perhaps I'd better go in there. There may be **work** for me, after all."

"Oh! Must you?"

"If you've studied your Handbook like a good girl," he said with forced levity, "you know what this may mean."

Fransi nodded unhappily. If the observations showed that the planet was already inhabited, the ship would be maneuvered into an orbit to wait while scouting expeditions probed cautiously, taking the measure of the natives, their level of achievement and the aspects of their culture which would be vital to future relations between them and humanity. Such encounters with other intelligent races had taken place three times before in the history they knew of; in each case, a *modus vivendi* had eventually been worked out. That was one of the even-

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tualities for which psychotechnicians like Piet were supposed to be prepared. But if there *was* intelligent life here, it would mean an end to the dream of pioneering a virginal new world.

"It's the number two possibility that has me bothered." Piet's frown was worried. "Suppose *this* is the time we make contact with the Others."

The Others—Fransi knew about that, too: the other race which had, like man, reached the stage of interstellar flight and begun to expand through the galaxy from some unknown point of origin; the Others of whose existence men had known for a thousand years, but whom they had never yet seen face to face.

Piet's brooding expression reflected the somberness of his thoughts as he envisioned the responsibility which, if the signs of life reported should signify the presence of those Others, would rest in large part upon his own youthful shoulders. The tardiness of interstellar communications would permit no shifting of that burden—the fearful responsibility of representing the race of man in its first contact with an alien species whose attainments equaled or perhaps excelled its own. On all psychotechnicians who went out with the interstellar ships, the possibility that

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they might have to play that part was firmly impressed in their training; but Piet fervently hoped it would not fall to his lot.

"*Attention!*" roared the speaker jarringly. "Prepare for zero gravity! Repeat—grab hold of something! Zero gravity in fifteen seconds!" The voice faltered, and the harsh sound of indrawn breath came clearly through. The people in the big room stared wildly at one another's suddenly white faces, shocked, uncomprehending. The speaker rasped, "We are about to take evasive action. Ships of unfamiliar type are converging on our course from several directions. Prepare for zero—"

Suddenly, sickeningly, they were weightless, as the gravitic drive field was stepped up to full neutralization to give the huge vessel its poor maximum of maneuverability. The colonists clung to the furnishings; most of them were speechless, but somewhere a voice whimpered hysterical fright. They felt infinitesimal tremors and lurches as the ship began to swerve and veer. The speakers had fallen silent.

Piet hesitated, decided against trying to make it to the control room. There could be little time; the evasive attempt was hopeless, if only because the remaining dregs of the fuel supply would not suffice to build up interstellar velocity again. If the attackers were merely bent on destroying the ship, this was the finish; otherwise—In any case, he could try to keep the people from panicking.

Even as he opened his mouth to speak, the ship rocked and rang. Voices cried out in fear and threatened to become an uproar.

Piet called out, desperately striving to sound calm and self-possessed: "Hang on, folks. That was probably a warning; whoever it is *must* at least be curious enough to board us. Remember what your Handbook says about meeting aliens—"

Another near miss made the ship shiver in every member. It was followed swiftly by a prolonged grinding, shuddering roar, as some vast mass collided with the outer hull and rolled or slid grappling along it.

Piet edged over to throw a futilely protecting arm around Fransi. He shouted above the rising tumult, "Everybody, *listen!* We're about to meet aliens. Their reaction to our arrival shows that they're violently suspicious of our intentions. We can't fight them and we can't run. Our chance, our *only* chance, is to show them we're peaceful. Everything we do must point to that—"

From the outer hull began a series of explosions, vibrating thunderously through all the great vessel, soul-chilling in their purposefully spaced repetition.

"They're blasting their way in!" a man bellowed. "Where are the guns?"

Piet, face bloodless, barked, "You're

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better off without them. Guns wouldn't help—"

"*Help!*" a woman's scream echoed him. "Somebody help! They're about to start killing, killing—"

The Great Ratk Dumur demanded expressionlessly, "It is done?"

"Yes," said the Second Greatest. "All of them have been removed from their ship, stripped of everything which might possibly be a weapon, and placed under close guard. The ship itself is still being searched minutely; but it appears to be quite safe."

"Good," said Dumur, but inwardly he tasted the sour juices of self-contempt. He had tried in vain to summon up the courage to board the captured vessel in person, but his conviction that the whole thing was too easy, that the enemy must have laid some profound snare for the unwary, had been too much for him. He had sent Aglur instead, half-hoping that the enemy ship would blow itself to atoms with Aglur aboard; but the Second had gone and returned safely and—it seemed to Dumur—clothed in a new and augmented insolence.

"Shall I tell them to proceed with the mind-probing?"

The scheming devil had even taken the Great One's next order out of his mouth. "Yes," said Dumur with difficulty. "Tell them to begin. I will come down presently to direct the interrogation myself."

When the Second Greatest had gone, Dumur sat glumly amid the untidy jumble of unfiled recording tapes, documents, and rubbish which littered his private office here on the second planet. The place had not been cleaned since the Great One had become convinced that the servant whose duty it was to do so was in Aglur's pay.

He picked up a sealed canister of his favorite ichor, opened it, and was about to quaff it when he bethought him that Aglur had stood all too near it and he was not sure he had kept all of Aglur's tentacles in sight. There were such things as hollow needles capable of introducing poison into a container without noticeable sign. He set the canister carefully aside to be analyzed—it might yield useful clues as to Aglur's methods—and, wheezing wearily, slewed around on his sucker-feet to fumble for the button which would fetch a fresh supply of ichor untouched from the stores. Aglur could not have suborned all the inspectors of the quartermaster division—or could he?

The Great Ratk brooded. Was he growing old? It seemed to him that when he had been younger—at any rate before his first mating had really taught him the meaning of pain and hatred—he had worried much less, had lived dangerously and liked it as a true Ratk should, considering danger even as the spice of life. Then, of course, he had been much lower in rank, in a position where relatively few would profit from his death. It was some consolation to realize that Aglur had his

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troubles too; there were plenty of ambitious ones below *him* who wouldn't mind bettering themselves. But a Great Ratk, at the pinnacle of success, was fair game for anyone. The advantages his position gave him in safeguarding himself were more than nullified by the fact that he was the sole individual whose disappearance would benefit everyone in the military hierarchy.

With an effort Dumur wrenched his attention away from those ever-present gnawing thoughts, back to the business in hand. The interception of the enemy ship had gone off like clockwork—with an ease, in fact, that made him uneasy. It did not seem possible that the enemy, whose awesome shadow had lain across the Ratk empire for a thousand years, could be so lightly met and overcome. They must have something. Some hidden weapon, some secret powers— But the mind-probes would force them into the open; the mind-probes would tell the complete story.

A wealth of valuable information could be expected from the examination of the ship, its equipment, its records—so seemingly unready for attack had the enemy been that even star-charts giving the location of some of his installations were among the captured material! But even this treasure would be insignificant beside what might be uncovered in the minds of the prisoners—not only their scientific knowledge, but their racial mentality, cultural attitudes, innate characteristics, which in the possession of trained experts in psychological warfare might become decisive keys to the ultimate destruction of all their kind by the Ratk.

Sighing, Dumur pressed the button which would summon guards to escort him to the interrogation chambers. He was still nervous at the thought of confronting the prisoners — who knew what they might still have up their sleeves—but it was high time he was putting in an appearance. Aglur, curse him, would be there now, very much on the spot, building his prestige with others who might be induced to aid his plotting.

The strain was telling sorely on him, the Great One realized as he waited for his guards. Sometimes of late, when Aglur was present, he feared that his self-control would snap and he would seize a weapon and kill his rival; that, of course, would be a crime of violence, punishable by disgrace and death. Better, much better—since Dumur was too busy to work out elaborate schemes of poisoning—to hire assassins; the idea was degrading, but there were plenty of Ratk of the baser sort who would commit violence for a fee, leaving the Great One's own tentacles technically clean. And then he would be able to rest easily again—well, more easily, perhaps. There would always be another Second Greatest.

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They prodded Piet out once more into the room of droning sounds that seemed to bore into your skull, of flashing lights that penetrated through the eyes and seemed to reflect from countless splintered mirrors inside your head. The partially incomprehensible machines that produced these effects, and that had yet subtler intangible fingers to pick your brain apart neuron by neuron, were there as before with their betentacled operators; but a new personage was present, a pouchy-looking monster flanked by armed guards, with some sort of insignia of rank on the complicated harness it wore.

Piet twisted his head round painfully to see what other prisoners had been brought out. His heart turned over as he saw Fransi there among three of the other colonists. All of them were in the same condition he knew himself to be—haggard, tattered, and dirty, bathed in perspiration in the hot steamy atmosphere their captors evidently preferred.

Fransi's eyes met his, and her lips shaped inaudible words. Piet couldn't be quite sure, but he thought they said, *Whatever happens —*

A mechanical voice, whose inflections shifted erratically as it picked words and phrases from a record-bank where they had been stored at the previous examination, said loudly: "Do you understand what you are hearing?"

Piet looked up stonily. "Yes."

"You will answer the Great Ratk."

Piet took that as a command, said nothing, staring at the sagging many-footed monster with the insignia. It gazed back at him with huge eyes that despite their alienness seemed to him to burn with a fire of unreasoning hate.

The Great Ratk made croaking sounds, and the interpreting machine translated them: "What was your purpose in coming here?"

Piet straightened his aching body. He felt physically drained by the steam-bath of the Ratk prison cells, and mentally battered by his session with the probe-machines and by the manifest hopelessness of the situation. He remembered how Captain Thorn had died—in a brief futile battle for the control room when the Ratk had swarmed aboard—and he wondered briefly if the captain had been right.

He said, "We come in peace, as I've tried to explain before." The translating machine rendered his words into the croaking of Ratk speech. "We hoped to establish a permanent colony on one or more of the planets of this star. We didn't know that it had already been occupied by you Others. But we were and are still prepared to come to terms with you on any basis agreeable to both. It is our belief that there is plenty of room in the Universe —especially since it appears that your kind is native to a Class A sun and naturally desires to colonize similar systems, whereas we are interested in Class G stars—"

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"What is the part of occupation of this sun in your overall plan?"

"There *is* no overall plan. We are simply a colonizing expedition. You have seen for yourselves that we carried no heavy weapons, that our cargo was of agricultural and construction tools, seeds, animal embryos, fertilizers. We believe that intelligent races can always work out a basis for coexistence—"

"Repetition is waste of time." The Ratk's great eyes swiveled; it singled our Fransi with a pointing tentacle. "You. Speak now."

"What do you creatures *want?*" quavered the girl. "You've never met us before. We've done nothing to you. We've come without hostile intentions—"

"Repetion is a waste of time," droned the talking machine again.

Dumur turned heavily to confer with his psychowarfare chief. "Are they consistent in taking that line? What are they trying to accomplish?"

"Those we have questioned uniformly express, or simulate, an attitude of surprise at our 'unprovoked' attack on them. As for the underlying motives—we have not reached them yet; deep probing technique will eventually destroy the higher brain centers and use up valuable prisoners, so we have delayed—"

"But we must get to the bottom of this!"

"Quite so. However, in order to reap the maximum utility from these specimens, it will first be desirable to feed them more information about *us*, so that in turn their reactions will yield us more information."

"Get on with it, then," said the Great One grumpily.

The prisoners watched dully as other equipment was moved to the fore — some apparatus evidently for reproducing recordings, a large screen. They eyed the latter, bewildered, as it lit with a star map.

It was recognizably a chart of this sector of the galaxy. But it was cut by unfamiliar co-ordinates and marked with irregular and obscure symbols.

A voice croaked explanation, and was echoed in human words by the interpreting machine. The map of the Ratk empire faded out and was replaced by a series of particular scenes — on planets, in space: the vast cities of the Ratk, their fortifications and armaments, their factories spewing out ever greater volumes of materiel; Ratk armadas maneuvering in deep space, making planetary systems quiver at their passage, testing monstrous weapons.

The focus shifted to Ratk history. The humans saw how the race, in whose power they found themselves now, had responded, a thousand years ago, to the first intimation of a menace to its supremacy in all space. How the effort begun then had continued unremittingly through the centuries, carried on with superhuman determina-

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tion and thoroughness as generation upon generation labored and died. How building up industrial and military might, framing an iron social order keyed to the grim prospect of the future struggle for galactic dominion, overcoming the immense difficulties of organization across interstellar distances to weld the Ratk empire into a hard defensive core and forge it into an offensive weapon of irresistible power—

Piet watched with eye-narrowed intentness, striving against weariness to comprehend every clue to the aliens' psychology which this exhibition might offer. He thought he understood why it was staged—to impress and overwhelm the captives in preparation for whatever variety of mental or physical torture might be next, and at the same time, probably, to study their reactions of fear or defiance to such a show of mobilized might.

He couldn't be sure how the other humans were taking it. But for him as he watched their captors' self-portrait unfold—there came home to him the realization of what manner of creatures these were. It was a realization that brought despair in its train, and helpless fury, and paradoxically at the same time a sort of resigned relief. If there was no hope of humanity's coming to terms with the Ratk—then he, and Fransi, and the others of this ill-fated expedition were lost; and the crushing burden that Piet had been carrying, the burden of trying to find a basis of understanding with the aliens, had rolled from his shoulders.

The big screen was blank. The mechanical voice said harshly, "You, who spoke first. Speak now."

Piet looked burningly up at the Great Ratk. Yes, he would speak. There was no longer any reason for diplomatic restraint; it was plain now that the Others had chosen and would always choose war.

He said clearly, "You evidently want to know what we think of you and your works, so you can use that knowledge. All right! I've understood one thing: that you're desperately afraid of us!

"Since you first found out you weren't alone in the galaxy, everything your kind has done has been dictated by fear. You've armed yourselves to the teeth, shivered behind fortifications that never seemed safe enough, lashed your population into despairing efforts of preparation. You've warped your whole society through fear, like some creature that diverts all its evolutionary energy into spines and poison-sacs, until it perishes choking on its own venom!"

He paused, half expecting to be interrupted; but the machine, and the glowering Ratk, were silent.

"And because suspicion is so inborn or ingrained into you, you've imagined for a thousand years that we must be preparing likewise, in the same fever of anxiety as you. You . . . fools! When *we* first became aware,

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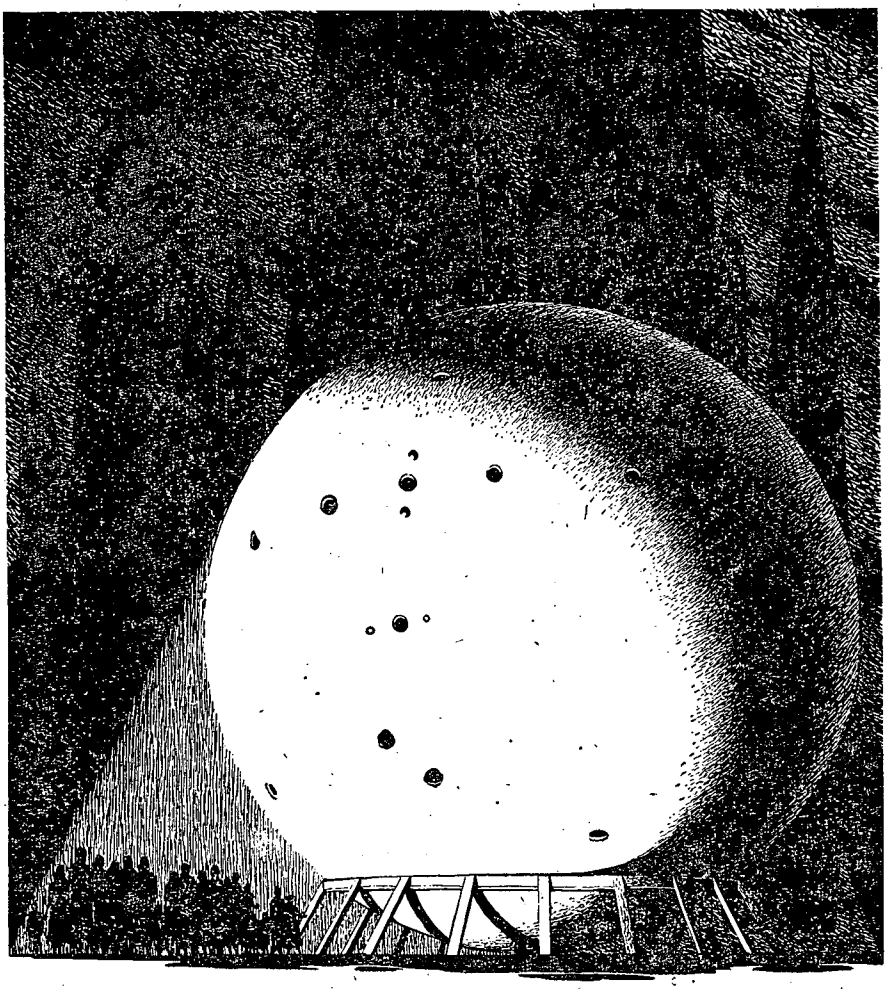

just as you did, that there was a second intelligent race in the galaxy . . . true, there were a few alarmists who talked of a possible clash; but most of humanity was too busy, with the work of colonizing the stars that was beginning then and has been going on ever since, to worry about it, . . . our wisest men said—and they were right!—that the difficulty of interstellar war would be too great, and its profits too small, for any *sane* beings to contemplate.

"Perhaps with the colossal war ma-

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chine you've built out of your fear you can eventually defeat and destroy humanity. Perhaps. But suppose you do! I still think we'll have had the better of it. We've had a thousand years, and they were worth it! A thousand years—while your race has existed in a tortured nightmare of hatred and insecurity—mine has been going on growing, building, achieving such happiness as we are capable of—*living*. A thousand years that for you has been a living death!"

The speech-machine said, "That is not clear."

Piet laughed, heedless of the armed monsters around him. "Not clear?" he said wildly. "All right, I'll tell you something perhaps you can grasp! From your star-map I see that your 'empire' is less than five hundred light-years across, and from your history that it was almost that large a thousand years ago. You've been consolidating, because you were afraid of us, concentrating your power in a radius you thought you could defend and where you could exercise a centralized control. But we've been under no such handicap. We've simply been expanding freely into the Universe, without concern for discipline or strategy, limited only by our ability to breed—which is excellent—and to build up our colonies as a basis for launching new expeditions outward. So, while a thousand years ago your race was distributed over a greater volume of space than we were, by now our advance posts must be more than two thousand light-years apart, and the Ratk empire is merely an island in the twenty-fold greater volume of space through which humanity is distributed. And, because the limiting factor is the velocity of light, you can never overtake our vanguard though you may defeat the rearguard—*you've lost the race!*"

The Great Ratk looked uncertainly to the psychowarfare expert. "What, in your judgment, does he mean by all that?"

"How should I know? He could be trying to make some, from his standpoint, advantageous impression on our minds. His last utterances, if truthful, seem to be information of military importance. But we will not know how to evaluate these creatures' verbalizations till we have gained insight into their thought processes by means of the deep probe."

Dumur pondered. His reflections were somehow disturbed—perhaps because he was unpleasantly aware of his Second Greatest standing unobtrusively close to him, and of the probable tenor of Aglur's thoughts. He said with abrupt decision, "Very well. We will use the probe now. I myself will try it first, on the one who just delivered the harangue."

The psychologist—and Aglur—looked at him a little oddly, but he thought coldly, Confound them! He'd show them that the old one still had the enterprise to lead, and the courage

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—since a certain amount of danger was involved in establishing close rapport with an alien and hostile mind—and before all, he would take no chances of the Second's being the first to volunteer for this operation.

While the probe apparatus was being readied, Dumur had time to suspect himself of an additional motive—an almost morbid impatience to learn what lay in truth behind the strange actions and language of the enemy. But that was a legitimate desire, was it not?

The probe hummed fiercely, and the blinker lights flashed. The face of the subject, held fast by the clamps, grew slowly distorted in the flickering glare. For minutes the Great Ratk crouched immobile, soaking up the increasing flow of impressions from the victim's mind, like a huge spider feeding on mental juices—then abruptly he threw the power switch, the humming ceased and the lights died, and Dumur disentangled himself with curiously numbed tentacles from the receiving electrodes.

"What is it, Great One?" the hovering psychologist inquired. "You can scarcely have begun to make full contact—"

"It is enough," Dumur muttered fuzzily. He came to himself, stiffened his flabby body. "I have decided . . . I wish to meditate on what we have found out so far, before continuing the examination. We will resume it one rotation period from now."

"But—"

"You heard me! Take the prisoners back to the cells for the present. That is all!"

As he had said he intended, the Great Ratk meditated.

In his locked and guarded private office, which he had inspected meticulously for the traps which Aglur or his creatures might have contrived to set for him in his absence; he felt a doubtful security which left him freer to think than he could feel anywhere else nowadays.

But his meditations nibbled at and recoiled from the monstrous, the unspeakable discovery which the deep mind-probe had laid bare before him. For a moment, striving not to accept that discovery, he grasped at the notion that the machine had somehow been tampered with—but that was foolish; not only would it have been impossible to produce such a result by interfering with the apparatus, but no one who could conceivably have had access to it could have had any imaginable motive.

Cravenly—was he growing senile?—the thoughts of the Great Ratk persisted in straying away from the new and indigestible concepts he had encountered in the captive's mind; straying back into his own memories of a long and successful lifetime, as if to seek some stability there.

Far back—clearly he remembered the voice and lineaments of the part-parent who had reared him. The voice,

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coaxing: "Come to me, little one, and I will give you this sweet ichor—" And then the vicious lash of punishing tentacles, cutting like lines of fire into his tender infant-flesh, and the voice jeering, "*That* . . . and *that* . . . and *that* will teach you to be beguiled by soft words and promises!"

The hard lesson, many times repeated in many forms—and in after life the lesson had served him well. Throughout his schooling, the beginning of his career in the service, the young Dumur had been always alert for the intention behind the mask, the hidden stab of treachery. He had survived in the fierce world of competition where the less wary perished and the less ambitious crawled off to some obscure niche where they would be sheltered from fatal envy. But Dumur had gloried in the envy of others, had parried their undercover thrusts at him and struck back adroitly. How he had rocked with amusement when the elder Aglur lay writhing, his belly afire with the very poison that he himself had intended to use to quench the star of his rising junior!

And then Dumur was a Great Ratk, a general in the war upon the Svi. For the first time he had fully understood the sense of the harshness of his training and of all Ratk life—when he had walked the face of a world seared lifeless by the power of the Ratk armada, seen the blackened shells of cities and the ashes that alone remained of a whole race and its civilization. The Svi were a menace; when their planet was discovered they were already thinking of space flight; so they had been unhestitatingly exterminated.

Nineteen, twenty years of his life—not counting, of course, in terms of years foreshortened by interstellar flight—and during all that time he had maintained himself in his high station, shrewdly and ruthlessly striking down this one or that who would have liked to replace him. Hardly ever had anyone held the post of Great Ratk for so long. It was a record to boast of—and he was weary.

His remembering came round full circle — back to the first moment of pain-racked self-awareness, the slashing tentacles, the jeering voice. That was the beginning. But was there no end? From that, to this: to the gross flesh waiting quiveringly for the envenomed pinprick that might lurk in every crevice, the draught of poison that might be in every drop of nourishment, among the plots, the spies, the assassins—

Through the murk of his broodings, like a sheet of lightning, flashed again the recollection of what he had perceived in the mind of the alien prisoner. It was insanity, pure and simple. Those creatures *trusted* one another. Not always, or implicitly—but through all their social relationships, their cooperative enterprises, their exchanges, their matings, ran a degree of con-

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fideuce in one another's motives which by Ratk standards was fatuous, imbecilic, totally insane. The utterances of the prisoners—unintelligible from the standpoint of psychological warfare—stood revealed by the mind-probe's evidence as *sincere*—the last possibility he would have considered before.

Their civilization as he had glimpsed it rested squarely on delusion; not a one of them but habitually gambled his fortunes and his very life on the well-intentionedness of others over whom he had no hold of fear or favor. Rivalries among them were apt to break out in open violence—and even in their violence they were prone to act on the assumption of a sort of fundamental understanding between enemies.

To Ratk eyes it was clear that such a social structure could scarcely last a day, let alone develop a high science and reach out to seize the stars.

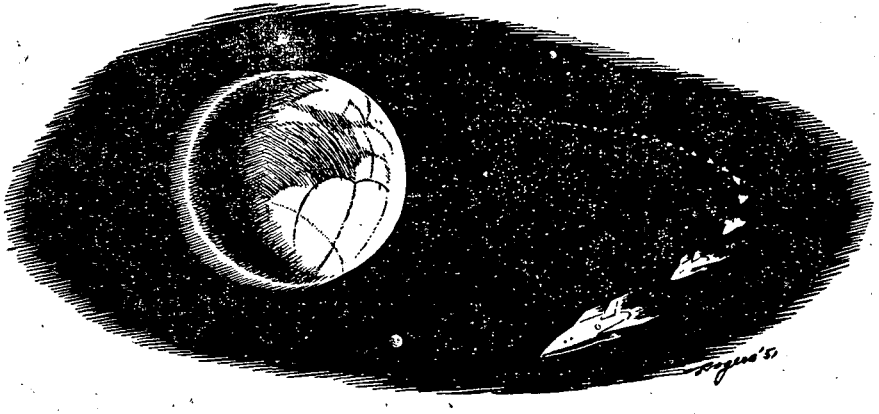
But it had. And that meant—it could only mean—that cold reason was bankrupt, and the Universe itself was mad.

"Mad," the Great Ratk said aloud in the deepening shadows of his chamber. The planet's sun had set outside the windows; the darkness closing in was full of menace. He started to throw the light switch, but halted, afraid, remembering an ingenious lethal device employing a light switch that he himself had once used to dispose of a rival.

He sat still for several seconds; then he repeated, "Mad!" with a quiet satisfaction in the word spoken for himself alone.

Recklessly he threw the switch; the office sprang into a blaze of light. With feverish impatience, he opened a communicator circuit connecting him directly with the spaceport.

The humans huddled together, surrounded by Ratk guards, on the cement-covered plateau of the spaceport



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under the cold stars. All of them were there, herded out en masse from the dungeon cells—colonists and crew with the exception of the few who had died when the ship was taken. They whispered together, gazing puzzledly toward their own vessel looming white in the glare of floodlights a few hundred yards away, flanked by grim black alien warships and surrounded by Ratk workers and machines.

Piet and Fransi found each other in the crowd. They clasped hands tightly; she shivered against him. "Piet, what are they about to do with us?"

"I don't know," said Piet somberly. "Our assumptions about the psychodynamics of an encounter with alien races have broken down with these creatures. By human standards they're insane—so ridden by maniacal suspicion that it's not possible to find any common ground."

A whistle shrilled nearby; the guard-Ratk croaked incomprehensible commands, but the motions with which they prodded the captives forward were understandable enough. They moved ahead toward the ship, and incredulously the humans saw the great locks opening, the landing ramps lowered.

The ship hurled itself through space, throbbing with the might of its full-fed engines. It was still accelerating at maximum, even though the Ratk-held sun had dwindled to a star behind and the danger of pursuit was clearly past —had, in fact, no longer existed since, minutes after they lifted, they had beheld the explosion that wiped out most of the already depleted fuel reserves of the Ratk fortress. It would be a year or so before the survivors back there could manufacture enough new stores again to fit out a ship for an interstellar crossing, to carry the story of disaster back to their home bases.

Fransi hugged her husband's arm as the two went down a lower-deck corridor. "When we get back," she said dreamily, "you'll be famous as the man who —"

"No," Piet denied. "I'm not even going to pretend to be the man who. I won't pretend to have seen the weakness in our self-appointed enemy's armor, or to have deliberately exploited it, because I didn't. They knocked themselves out—and they'll do it again, sooner or later, whenever and wherever they come in contact with humanity. In a conflict of species on a Galactic scale, what they do or try to do is secondary to what they *are*."

The corridor ended in an open door across which stout bars had been welded. Through the grille he who had been the Great Ratk eyed the two humans as they approached — noting how they walked close together, arm in arm, blissfully confident of each other.

He croaked, "Hello," the greeting echoed in human speech by the translator which had been installed here

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according to one of the last instructions he had given as a Great Ratk—before he had ordered all others of his own kind off the ship and boarded it alone with the liberated prisoners.

"Hello," responded Piet. "Is everything all right?"

"Yes. Everything is well. And it will go on being well, will it not?"

"As I've told you so often before," said Piet gruffly, "we can promise you that, when we reach the human-occupied system we're bound for, you'll be kept alive and well-fed and suitably lodged for the rest of your natural life. Our scientists will be anxious to communicate with you."

"Yes, yes," said Dumur happily. "I have implicit faith in your word. Oh, what a relief it is to trust someone!"

"Of course, we must continue keeping you under some restraint—"

"Naturally, I understand. You humans are all crazy, but you are not *that* crazy."

"Here," said Fransi hastily. "We've brought your day's supply of ichor."

The Ratk seized the proffered canister in eager tentacles; he inserted a drinking-tube into it, then hesitated, looking up at the humans. "It is not poisoned?" he demanded slyly.

"Of course not!" said Fransi indignantly.

"I believe you," giggled the ex-Great One. "Isn't it wonderful? I, too, am quite insane!"

THE END

"COME AND GIT 'EM . . ."

We have some back issues available for sale; from April 1951 to date we have 'em all. Before that, it gets spotty; there's precisely one copy of the August 1945 issue, and the next one is a single June 1946, followed by one March 1947. From May 1947 on, your chances are pretty fair . . . if you're the first in with an order.

Prices: 35¢ up to one year old, 50¢ up to three years old; three years and older, 75¢.

There are collectors, and these older copies are stocked for their use. We have plenty of the '52 and '53 copies; if you're not interested in collecting the magazine, however . . . give the genuine collectors a break on the old copies, please.

THE EDITOR

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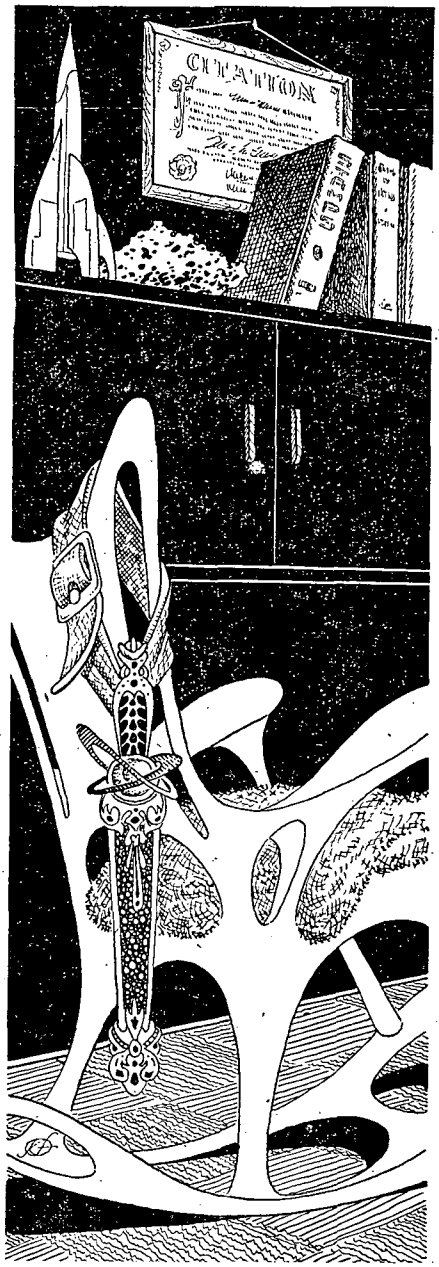
AGE OF RETIREMENT

***The course** of evolution shows that the highest achievement of one species becomes an embryonic development in succeeding higher forms. And so, too, perhaps, with cultural evolution.*

BY HAL LYNCH

Eighty miles below us was the south continent of the planet Uriel. I gave the order, and we roared down, down toward the city of Sathos that had never known night, where the light of four moons filled the sky when the sun was gone. The *Spacebolt* swooped low over the city, and we dropped our blackness bombs. An inky cloud rose out of Sathos behind us as we arced to return.

I looked across at my troopers, waiting beside the belly-hatch. "The



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word is that the city's cleaned out, except for the flickos, and you know just where they'll be hiding. When you hit the streets, blast anything that moves!" Sergeant Kregg grinned, and signaled his boys to switch on their null-gravs. We were over the city again.

"O.K., sergeant, let's go get 'em!" I yelled. I led the drop down through the open hatch and into the blackness of Sathos, where the flicko gang waited. They hadn't expected a blackness bomb, they were scattered and confused, but they still knew how to fight. The stun-guns crackled as my troopers dropped into the streets and started hunting the flickos down. Sergeant Kregg and I went after the leaders, who were holed up in their dive downtown. They had a nauseator spraying the streets in front of the place, but the sergeant and I managed to keep out of its line of fire while we moved up. We located them on the third floor; it was already getting lighter, now.

From behind a set of steps, the sergeant shouted our we're-here-to-help-you summons. They answered with a nauseator blast, but they couldn't reach him. I fired a couple of stun-shots from my side of the street, but they were protected, too.

"Stubborn!" said Kregg. "You 'n' me can pick 'em off, though, soon's it gets light enough."

"Let's use sleep-gas; I'm in a hurry," I said. His face filled with disappointment. "That's an order, sergeant!"

The gas did the job. Soon we had them all "cuffed and counted." Kregg called the ship down while I recorded the operation details.

"Any injuries, sergeant?"

"One o' them has a skinned elbow; that's all, sir." He and the troopers herded our prisoners aboard, then he came back.

"Fastest operation I've ever seen," he said confidentially. "I'll bet it's a Space Patrol record, sir!"

I knew it was, and felt good about it, but I couldn't let him know it, of course. I just grunted and snapped back his salute. "Turn 'em over to the local psychomedics and bring your troop back to Mars Headquarters. I'm not going back with the ship; I'm returning by mattercaster, to make the commander's step-down. Take over, sergeant!"

There were a few old folks at the mattercaster station, but they stepped aside for my blue-and-gold uniform.

"Right in here, captain!" said the attendant, leading me to the nearest booth. I felt a twinge of regret as I settled myself on the cushions. I'd have preferred to have flown my ship back. The *Spacebolt* was certainly the trimmest, fastest ship in the whole sector, and it would have been fitting to have flown her in, but we'd run out of time. Even traveling by mattercaster I'd be lucky to be in time for the ceremony.

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When I stepped out of the Patrol receiving booth on Mars I found Wenda waiting for me. She saluted me smartly; prettier than ever in her dress uniform. I realized inwardly that I'd have to watch myself. I'd have to stay away from her if I didn't want to wash myself out a couple of years too early.

"Tommy, I've never been to a Final Review before," she whispered as we hurried down the corridor. "Are they very exciting?"

"Almost as dull as traveling by mattercaster." I didn't mean it, of course. They were wonderful. But I wasn't going to enjoy this one at all.

We started down the steps. "I wonder how the chief's taking it? I mean, knowing this is the last one, and all."

"I suppose he's got used to the idea," she said indifferently. We could hear the crowd milling around out on the field, now.

Suddenly I just had to tell somebody how I felt. "It's not fair, Wenda, *it's just not fair!*"

She stopped, and looked at me worriedly. "You mean making the chief step down? It's for the good of the Patrol, Tommy—you know that. It gives the younger officers a chance."

"They'll get plenty of chance! Wenda, the chief's as good as he ever was. He can handle anything they throw at him, he—"

"Compulsory retirement at his age is one of the most important Patrol regs! Now, hush—we'll be late!"

As we came out onto the parade ground Colonel Croslake stepped over to meet us. He saluted, and shook my hand.

"Congratulations, Tommy!" he smiled. "I just heard you stopped another afflicted gang!"

"Tommy! You never told me!" said Wenda.

"I picked 'em up on Uriel. It was short and sweet; we were lucky. A little shooting, but no real trouble."

The colonel clapped me on the shoulder. "Keep up that sort of work and you'll be staff rank in no time." *I'd better hurry*, I thought to myself. *The way things are, I'd better hurry!* "Uh-oh. Guess we'd better fall in. There go the bugles!"

We found our places while the call sounded. Across the parade ground row upon row of pink-cheeked cadets "snapped to," and stood stiff and silent. In the quiet we could hear the distant noises of the rocket sheds, and the faint stir as the first of the troops marched onto the lower end of the field. Then the color guard appeared, followed by the band, playing the inevitable "Patrol Alert," and after them the top brass, trim and stern in their new dress blues.

Last of all came the chief, with Halligan, his successor, walking beside him. He already looked older, somehow, and different, though he still marched straight as a ramrod and every inch a soldier. He took his place in the re-

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viewing stand; the band struck up "The Colors," and the chief watched his troops march past in review for the last time. Picked men, they were, from all his old campaigns, here to see the Supreme Commander of the Space Patrol step down. I'm not ashamed to say I felt like crying.

After the last of the troops had passed there was a moment of silence, then the chief made a little speech. I don't remember what he said but it was great. The way he said it made it great. Afterwards he unbuckled his ceremonial belt and fastened it around Commander Halligan's waist while the band struck up "Honor of The Patrol" and we sang it with tears streaming down our cheeks. Then we cheered until we were hoarse while he went to each one of his staff and shook his hand. While we were cheering I suddenly saw my older brother, Bill, standing in the little crowd of older people at the edge of the field.

Our new C. O., Commander Halligan, made a speech, too, but it was sort of an anticlimax. Then we stood Retreat and the chief's Final Review was over. I'd have liked to have had the chance to say something to him personally, but I knew I could never get to him in the crowd. So, as soon as Halligan called "Dismiss!" I went to find Bill. I avoided Wenda and struggled through the crowd of swarming cadets and troopers to where my brother waited. He grinned down at me.

"Hi, cap'n!" He looked like a stranger in his civvies. We talked for a minute or two about the family—I hadn't seen as much of them recently as I should have—then I led him away from the crowd, down toward the rocket sheds. Things were quieting, and the sun was going down.

"How are things in that, uh . . . philosophy school?" I asked, to be polite.

"Interesting—even exciting, sometimes."

"I'll bet!"

"I mean it, Tommy. We came across a relationship between music and social thought the other day, that—Well, I'll explain it to you sometime. It's new, and it's wonderful, and it has all kinds of possibilities. By the way, I hear we're going to get your chief, now that he's retired."

"In your school? You're crazy, Bill!"

"He's got quite a brain, that one. We can use him."

I stopped walking. "Listen, Bill, I've got to talk to you," I said. "I don't understand this thing. I just don't get it."

"What's the trouble?"

"Why does the chief have to step down *now*? He's the best we've ever had! Why did they make him quit?"

"If by 'they' you mean outsiders, you're wrong, Tommy. Compulsory retirement is the Patrol's own regulation. It wasn't forced on them from outside. Members of the Patrol staff

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set the age limit themselves. And, of course, it's been set for everybody; the chief's rank doesn't make any difference. He had to step down just as I had to when I reached his age. We just aren't any good any more, kid."

I grabbed his arm. "Don't give me that! Before I took my last duty-tour I spent some time up in the library. I was looking through some old viso-books, and I found some stories of the Patrol . . . of the Patrol of a hundred years ago. They had troopers as old as thirty, then!"

"Sure, kid, I know. And you may not know it, but if you check on law-forces that go back before the Patrol you'll find they used to have even older men. They recruited at an older age, too. But by the time the Patrol came along it had been found that older men just didn't have the speed of reaction, or the coordination, to keep up the pace. So they started retiring men younger, and recruiting men younger.

"Then there was another factor: much less killing. Murderers are rarer than Mars clouds these days, but I guess you noticed in those stories that most of the criminals used deadly weapons. In these days of stun-guns and sleep-gas, bringing in the trouble-makers is a lot less dangerous. That's helped to lower the recruiting age, and in turn, the retirement age."

"What're criminals?"

"It's an old word for afflicteds. You never paid enough attention to history, Tommy. You'll have to specialize in it after you step down."

"I don't even want to think about stepping down," I growled. "I've still got two more years. Maybe . . . maybe if I ever get on the staff, I'll be able to change that retirement reg!"

Bill seemed to find that amusing. "Not a chance, Tommy. They've tried, and it just doesn't work out any other way. When you reach sixteen, Final Review and out you go—for the good of the service!"

"Are you trying to tell me my co-ordination will be shot at sixteen?"

"Look at me," he grinned. "At nineteen I'm finished." Then he got serious. "No, kid, it isn't that. Something else is missing—a certain spirit, or idealism, or maybe a kind of instinct. You see, our race has changed in the last couple of centuries, Tommy. For one thing, our educational system's been put into high gear, we take on responsibilities sooner than our great-grandfathers did, and by the same token we . . . uh, we settle down a little sooner. Our expansion into space has brought us into contact with dozens of other cultures, some of them centuries older and wiser than ours. So, somehow, we've settled down, as a people, to a different outlook on life than our ancestors had."

It seemed to me he was getting way off the subject, but I let him talk. We turned and started back toward the parade ground; the sun had set and it was getting pretty dark.

"Tommy, we've started on the big

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adventure," he went on. "We've started on the biggest exploration of all, the exploration of ourselves. That's become so important to us that we don't have time, or inclination, for other things.

"But there are still afflicteds, and I guess there always will be, no matter how much the world changes. Somebody's got to take the time and the trouble and the thought to round 'em up and bring 'em in for treatment. Somebody who still has the patience to take authority and routine without sinking into corruption, who can think without brooding and act without anxiety over consequences. Somebody who can fight without hate and live without sorrow, somebody who can give his whole heart to a cause that gives him little or nothing in return.

"So we've turned the job over to you, the younger generation. We've given you the weapons and the know-how, and you've supplied the—heart."

"Bill, I don't understand a word of what you're talking about. I don't get it."

"You will, Tommy, you will," he said quietly in the darkness. "In a few years you'll see what I mean. The Patrol's found out that after your fifteenth year you somehow 'put away these things.' The glory dies away, as new yearnings come, until you find yourself a stranger to what you used to be. So the Patrol makes you step down before you reach that point, Tommy. Compulsory retirement, before you stop caring, any more."

"*Stop caring about the Patrol?* That's crazy!"

"Trouble is, Tommy, you don't care when you're grown up."

THE END

IN TIMES TO COME

Next issue features Jim Blish's novelette "At Death's End" . . . which is, in essence, the very first of his Oakie series. Trying to make a living, trying to act in an ordered, rational manner in the period when a planet's civilization is breaking up, to burst forth in a thousand new directions—that is no easy task. And one small group of people was trying, very hard, to add one last factor that would really blow the lid!

And van Dongen's cover for this one is highly interesting. It's symbolic of the story—but even more, it's definitely symbolic of what's happening in the world today!

THE EDITOR.

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BY P. SCHUYLER MILLER

THEY STILL FLY

Tonight there are two flying saucers circling around over Pittsburgh.

They're huge, bright disks moving at what—judging from the geometry of the situation—must be speeds of up to twelve hundred miles an hour. Every so often they pass right through each other.

They are, of course, searchlights playing on a cloud level at around four thousand feet.

The original rush of flying saucer books has been equalled during the past year by a new burst of volumes which insist that they tell all. And perhaps, among them—or among the three I have seen and am considering here—they do.

This much is clear: there are "flying saucers" and many, or even most, of them are not hallucinations. From there on, the schools of thought divide. One, typified by Donald H. Menzel's "Flying Saucers" (Harvard University Press, 319 pp., ill., $4.75), seeks an explanation in known, or perhaps still undefined, *natural* phenomena. The other, of which Major Donald E. Keyhoe's "Flying Saucers from Outer Space" (Henry Holt & Co., 276 pp., $3.00) is perhaps typical and "Flying Saucers Have Landed," by Desmond Leslie and George Adamski (British Book Centre, 232 pp., ill.,

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$3.50) represents the extreme, appears to seek the least probable cause in an invasion of spacecraft using, and obeying, completely unknown laws of physics.

Both schools agree on two things: things are seen, and a fair proportion of them do not conform, *on the available data*, to recognized natural phenomena. They differ violently on how big that proportion is.

To dispose of the extremists first, the Leslie-Adamski book merits serious consideration by saucer students only in so far as Desmond Leslie, a British occultist, extends the documentation of saucers and saucerlike phenomena through obscure sources and into ancient times. Drawing on the works of Madame Blavatsky, Ouspensky, James Churchward, Ignatius Donnelly, Annie Besant, C. W. Leadbeater, A. P. Sinnett, "The Tibetan" and other occultists, Leslie finds what is to him ample evidence that flying saucers were known of old, are "explained" in ancient Sanskrit and Tibetan books (they may have been controlled, if not driven, by "song"—music), and are the chariots of other-worldlings come from the stars to discipline us for our present shortcomings. He uses two thirds of the book to document and enlarge on this theory.

The last sixty pages are an account by one George Adamski of Palomar Gardens, California, of the saucer which he says landed and the saucer-pilot who got out and talked with him on November 20, 1952. He publishes several photographs allegedly taken through his telescope or at close range, showing two types of flying craft. One—the "mother ship"—looks like a plastic whistle or recorder in silhouette. The "saucer" looks like an old-fashioned streetlamp shade to which three plastic balls and other understructure have been attached. A "confirming" photograph of a "saucer" over Manhattan is clearly the effect of a bright light shining directly into an unshielded lens (such "saucers" often flit in and out of quite ordinary Hollywood productions when sunlight or intense studio lights are allowed to strike the camera lens—and some of these "saucers" must presumably have been zooming around inside a soundstage amidst a mob of actors, electricians, stage hands and what have you).

Personally, I find it very difficult to take Mr. Adamski's story, attested though it is by the affidavits of three friends, seriously, though ostensibly it is the account of a man who talked for several minutes with a man from another world and who three weeks later was presented with "a brief technical account of the saucer and its working method of propulsion" in a collection of very strange characters.

Major Keyhoe, perhaps the best-known protagonist of the "other world" source for the saucers, is a witness of another sort. Presumably

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we can take the Army Air Force's evaluation that he is responsible and accurate in his reporting. He adds to the catalogue of his earlier book—"The Flying Saucers Are Real"—a detailed documentation of many sightings running up into February, 1953. A retired Marine officer, he is no mystic, no occultist, and sounds skeptical of Mr. Adamski's claims.

He is also no scientist. His book contains statements as fact which have a mildly ridiculous sound and should have been edited out if the Air Force—as we are led to believe—is using him as an unofficial "leak."

Example: page 34—a report of Air Force Intelligence's Project "Sign" is quoted (and I *do* mean quotes) as follows: "Outside the solar system other stars—twenty-two in number—have satellite planets." That's news to me, and I suspect to most astronomers, who are credited in the rest of the quotation with accepting a proportion of "one ideally habitable planet for each of the twenty-two other stars." As a bonus: "The theory is also employed that man represents the average in advancement and development. Therefore, one half the other inhabited planets would be behind man in development, and the other half ahead." This is supposed to be Air Force Intelligence reporting the consensus of modern science, not a story in this or any other magazine!

The author's—or the Air Force's—peculiar ideas about astronomy and geology are further indicated on page 226, where he quotes Dr. George Gamow to the effect that "the Earth's ice ages were caused by certain unknown changes on Saturn and Jupiter." Shades of astrology! (I haven't been able to trace this in Gamow's books, by the way.) In spite of the fact that saucer sightings are reported through February '53, as of that date (p. 180) the nature of "radio stars" is alleged to be an utter mystery.

I've saved the two prize bloomers until last: it is impossible for me to believe that anyone who knows anything about science could make them.

Pages 49 and 50: a detailed description of Air Force Intelligence's "defraction grid" cameras which reveal the source of a saucer's glow "by breaking down an image into small sections." Perhaps we are supposed to believe that this clumsy version of *diffraction* has been deliberately confused by the Air Force to conceal a military "secret."

And king of them all, page 116—again supposedly coming from Air Force Intelligence via its then Press Officer, Albert M. Chop: soil samples gathered from a "landing" site in Pittsburg, Kansas, so that they could be tested for radioactivity, "were broken up when they came in, so they couldn't make an accurate analysis." Does any ASF reader have to be told that no amount of breaking up affects the radioactivity of a sample? Evidently Major Keyhoe doesn't know it.

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Assuming that Major Keyhoe is sincere in his statements, as he certainly seems to be, his revelation of allegedly secret Air Force conclusions is to say the least remarkable. If he quotes Air Force Intelligence precisely in the examples I have just given, somebody is making a monkey of him. If he doesn't, and doesn't know any more about science than these statements seem to show, how much credence can we place in his other pronouncements?

There's also at least one neat bit of circuitous reasoning involved. Way back on page 3 we're told that Air Technical Intelligence Center's designation for flying saucers is UFO's (unidentified flying objects). It then follows that any "unidentified flying object" is a flying saucer . . .

Neither Keyhoe nor Leslie—nor, we are told, the Air Force—has any use at all for Donald Menzel, Professor of Astrophysics and Associate Director for Solar Research in the Harvard Observatory. What Menzel does, in addition to presenting an imposing cyclopedia of reports of similar aerial "objects" since Ezekiel's time, is point out that there are, in fact, a wide variety of atmospheric phenomena—some of them reproducible in the laboratory—which yield disk-shaped or elongated images in various colors. I've seen some of them myself: the searchlight disks; a green daylight fireball (result of magnesium, Menzel says, not copper); a sundog; a Brocken halo; innumerable auroral "spotlights"; Venus by daylight (though I still can't swallow anyone's seeing that brilliant pinpoint as a disk).

Some of these phenomena (and, according to Keyhoe, the Air Force denies this) will also produce "blips" or images on a radar screen, since radar waves are simply long light waves—as many UFO's have done. But Dr. Menzel admits freely that from the descriptions given there remain "saucer" sightings which do not match any *known* atmospheric phenomena.

Fanatics of the Leslie-Adamski school need no physical explanation for flying saucers, since by definition unexplained phenomena belong in the realm of the occult, and the occult "explains" all things. It is difficult in these cases to say where sincerity ends and an open hoax begins (Keyhoe believes a glowing green "monster" which alarmed Sutton, West Virginia, in September '52 was a combination of meteor, owl, bushes and hysteria).

But it is interesting to note that the University of Denver class which heard the original "little green men" lecture by Silas Newton in March 1950, and launched the Frank Scully school of saucering, had set up *in advance* a few simple criteria for judging what they might hear. Menzel quotes them (pages 150–151):

1. Reports should be firsthand.

2. The material should be free from prejudice, presented by someone with

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an unbiased view.

3. Information will carry more weight if it comes from a trained rather than an untrained observer (and being an Air Force pilot doesn't necessarily make one a trained observer of atmospheric phenomena).

4. The data should be available for double-checking. (In the greater number of Keyhoe's cases, names and places have allegedly been changed by the Air Force to *prevent* checking by anyone but Major Keyhoe.)

5. Statements must be "signed" by the reputation of the persons who make them.

On the basis of these simple and reasonable criteria the Denver general science class rated Newton's story fiction.

The skeptical, Menzel approach to the whole question is: there are natural phenomena which many people interpret as "flying saucers." We don't know what all of them are. The saucer-fanatic approach is: there are flying saucers, which some bigoted scientists try to interpret as natural phenomena. Of course, we know they're wrong.

All I care to say is: read Menzel—so that you'll know what physical possibilities exist—read Keyhoe and anything else that comes along. And before you make up your mind on any saucer *you* may see, give it the Denver five-point test—plus a liberal application of the scientific "law of parsimony," that the simplest explanation is usually the best one.

BRING THE JUBILEE, by Ward Moore. Farrar, Straus & Young, New York. 1953. 196 pp. $2.00; Ballantine Books, paper 35¢

Many readers may find this Ballantine "Dual Edition" deliberately dull; others, who may recall Winston Churchill's now famous contribution to the symposium, "If," will be fascinated by the care with which Ward Moore has worked out the portrait of a strange, arrested American society in a world where Lee won at Gettysburg.

The world we are shown, and in which we follow Hodge Backmaker from boyhood to his death forty-four years "before" he was born, seems to me to be one which has retrogressed to a cultural and economic level before the War for Southron Independence, rather than one "frozen" in 1863. The United States are an impoverished shell; Indian nations still control parts of the west; the Confederacy and Europe seem to be more advanced mechanically and educationally, but only in degree. Children and adults are sold into bond-slavery. A few "minibiles" clatter along the dirt roads and cobbled streets, a few "express" balloons operate over short distances; the States have been unable to push a railroad to the west coast—though the Confederacy has several roads and British America has one. The South has earned its name by engulfing most of Latin America.

In this strange, yet strangely familiar world we watch Hodge grow from

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boyhood in Wappinger Falls to adolescence in New York, to entanglement with the terrorist Grand Army, a self-gained position as a historian, and eventual fellowship in the strange scholastic community of Haggershaven, Pennsylvania—where a tormented, tormenting young woman is building a time machine. In the end, as from the beginning it is clear he must, he goes back to observe Gettysburg . . .

Those who recall Mr. Moore's "Greener Than You Think" and the original, shorter version of this book in *Fantasy And Science Fiction* will expect the mature, meticulously thought-out structure of "Bring the Jubilee." It won't be to everyone's taste. But it will be interesting to see what the non-specialist reviewers have to say.

FAHRENHEIT 451, by Ray Bradbury. Ballantine Books, New York. 1953. 202 pp. $2.50; paper 35¢

Usually the hard-cover editions of Ballantine's more important titles—which appear simultaneously in cloth and paper bindings—are handled by Farrar, Straus and Young or some other of the larger publishers. This new Bradbury, however, they've kept for themselves.

The long title story—451° F is allegedly the fire-point of book paper—is blown up from "The Fireman," the *Galaxy* novelette of 1950. It is another of Bradbury's bitter, almost hysterical diatribes against the ultimately mechanized, regimented world in which individuality is crushed under conformity. A girl who disturbs the fireman-hero, Montag, momentarily is the niece of the man whose own struggle to preserve his self was described in "The Pedestrian."

Montag is a Fireman—one of a company whose duty is to find and destroy those instigators of deviation, books. Instead of changing history, as in Orwell's "1984," the Firemen eradicate it and those who are tempted by it. But Montag is tempted: he secretes a book here and there, reads snatches of them; forced to the breaking point, he is denounced by his wife, fumbles feebly with an underground revolt, finally flees from the ashes of his own house with the Mechanical Hound baying at his scent.

The second of the three stories in the book, "The Playground," is a fantasy of nonconformity. Rather than have his son face the vicious cruelty of the "children" on the Playground, Underhill trades bodies with him. Finally, in "And the Rock Cried Out," brown-skinned Indian-Americans corner a United States-American couple after the white people of the earth have destroyed themselves in a last war.

It seems to me that Bradbury is still most effective in his very short stories. As stories, I have liked his early fantasies in "Dark Carnival" best; for cumulative effect his "Mar-

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tian Chronicles" stand out. In spite of the emotional drive and compelling, nagging detail—the television walls—of "Fahrenheit 451," the story seems to lose momentum in its longer form. But any Bradbury book is bound to be an event. Why not do what I do: read it at 35 cents, keep it at $2.50 if you like it. This is what Ballantine's publishing program makes possible.

RING AROUND THE SUN, by Clifford D. Simak. Simon and Schuster, New York. 1953. 242 pp. $2.75

This is the first science fiction offering in some time from those knowing publishers, Messrs. S&S. It is more on the level of the author's "Cosmic Engineers" and especially "Time and Again" than his memorable—and prize-winning—"novel" of the dogs, "City."

In 1977 the world is deluged with razor blades that won't wear out, immortal light bulbs, the Forever Car. Its economic structure quite naturally goes into convulsions, and for some obscure reason writer Jay Vickers is picked to cope with the saboteurs. Perhaps it is because he has queer memories of his own, having to do with the remarkable behavior of a child's top. And there's the Aldridge theory of continuous worlds—the mouse that isn't a mouse—an old man named Flanders who comes and goes peculiarly.

The trail takes Vickers back into his own past, to his own memories—and beyond, to mix with robots and androids in worlds beyond worlds, with Ann and the ephemeral Kathleen. If you thought "Time and Again" was involved, with its shuttlings through time, try this.

SENTINELS FROM SPACE, by Eric Frank Russell. Bouregy & Curl, Inc., New York. 1953. 256 pp. $2.75

A new publisher in the science fiction field—whose executive end includes Dave Kyle of Gnome Press fame—has started out with a lightweight but oddly enjoyable piece of entertainment by the author of "Sinister Barrier" and "Dreadful Sanctuary."

This is another "we're property" story. (it was "The Star Watchers" in its magazine version). David Raven, superman, is enlisted by the Terran Security Bureau to unravel and snarl up an anti-Earth conspiracy by mutants from Venus and Mars. He slugs and magicks his way in and out of predicaments with an ease and smoothness more than a little reminiscent of Gilbert Gosseyn in van Vogt's "Null A."

The whole thing is written with a free-wheeling flippancy which may be painful to some people or may be fun, if you like farce-action and patter. As entertainment, I liked it—and you *could* even consider it a parody on a van Vogtian superman entanglement.

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(I'm giving nothing away to quote the jacket and point out that Raven is "something special"—what is one of the questions around which the plot cavorts.)

FLIGHT INTO YESTERDAY, by Charles L. Harness. Bouregy & Curl, New York. 1953. 256 pp. $2.75

Bouregy and Curl have launched themselves in the science fiction field with two variations on the van Vogt superman theme (see Russell's "Sentinels from Space.")

This one is set a few hundred years in the future, in an uncomfortable sort of society: an authoritarian imperium with a busy underground in the Society of Thieves. Most mysterious of the Thieves, a man with no past and a dubious future, professor by day and Thief by night, is Alar—whose struggle with the "wolf pack" of the Imperial Police, with representatives of the human memory-machine known as the Microfilm Mind, and with assorted other mysteries keeps the plot confused.

There's the beautiful Lady Keiris, wife of the vanished—is he really dead?—Kennicot Muir and slave of Chancellor Haze-Gaunt. There's the tiny, trembling tarsier that came out of a fallen spaceship and is now the Chancellor's pet. There is the tittering, sadistic psychologist Shey—who kills Alar on page 99 (our hero dies again, in a box floating on the surface of the Sun's atmosphere, on page 235—and learns his identity).

Again, this is action-entertainment, fast-paced enough so that you don't stop to bother with inconsistencies or improbabilities.

THE BEST SCIENCE FICTION STORIES: 1953, edited by Everett F. Bleiler and T. E. Dikty. Frederick Fell, Inc., New York. 1953. 274 pp. $3.50

A Bleiler-Dikty collection is one anthology that is always worth your money, and Fell can keep up there with the leaders—as Scribner does with its annual Heinlein teen-ager—without publishing anything else.

This year's collection—of stories published in 1952—seems to me to be especially good, once you accept the premise that Bleiler and Dikty give you a balanced anthology rather than one that is literally "best" of the year. It also has a snappish but challenging introduction by Alfred Bester of "Demolished Man" fame which may lead to some discussion here and there. Its gist is that science fiction doesn't measure up to the Great Literature status everyone hopefully assigns it, that by and large we're still childish and paranoic.

If you read only this magazine, you'll remember Mark Clifton's "The Conqueror" (the dahlias which make over mankind); Eric Frank Russell's bitter little "I Am Nothing" (a child and a Space-lord); and Russell's "Fast

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Falls the Eventide," the poetic vision of human children going out to teach. The other twelve stories are from other sources: four from *Fantasy And Science Fiction*, five from *Galaxy*, three from *Thrilling Wonder*. The minor magazines stayed minor in '52.

My favorite of the book, I think, is Zenna Henderson's "Ararat," the story of a young schoolteacher in a community of strangely powered folk. Then there's Arthur Porges' miniature, "The Fly," and John Wyndham's terribly grim "Survival." Another grim question is raised by William F. Temple in "Counter-Transference": if insanity is the norm, who are the sane?

John W. Jakes' "Machine" you may consider fantasy rather than science fiction. Murray Leinster's "The Middle of the Week After Next" is the old master in a time-whimsical mood. In "The Dreamer," Alfred Coppel brings a daydream down with a crash and in "The Moon Is Green" Fritz Leiber spins a nightmare of the world after the Bomb as only he can do it. This is another of the memorable stories in a memorable collection. A third is Walter Miller's "Command Performance," a tragic variant on the aloneness of the telepath in a stolid world.

But if the best stories in the collection seem to have grim undertones, there are bits of pure entertainment like John D. MacDonald's "Game for Blondes" as relief, or Frank M. Robinson's very human "The Girls from Earth"—until Richard Matheson wrings the grue out of a strange planet in "Lover, When You're Near Me."

I'll stand by it: this is the best "Best" we've had—carping introduction and all.

THE SYNDIC, by C. M. Kornbluth. Doubleday & Company, Garden City. 1953. 223 pp. $2.95

Here's one of the hot contenders for "best of the year" ratings, from that eminently reliable young man, the author of "Takeoff" and co-author of "The Space Merchants."

It's a truism with anthropologists that we are our culture. Our values, our taboos, our ideals, of course our laws and customs are determined by the kind of society in which we happen to grow up and live. And if your cultural pattern teaches you that the sincerest tribute to an honored guest is to barbecue him for Wednesday dinner, I'm not coming 'round your way if I can help it—at least, not as a friend.

The world of "The Syndic" is one of those post-World-War-III worlds in which the patterns of our time have changed grotesquely. After a century or two under ineffectual, corrupt governments the people of North America have turned to the only stability in their time: a rule by organized crime. (At the same time, in Ireland, the old

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witchcraft has risen again among womankind.) The Syndic in the east, the Mob in the west, and a piratical Government with its base in Ireland—these are the three forces in the world.

Charles Orsino, Syndic heirling, volunteers to let himself be planted as a spy among the Government forces. Then things begin to go wrong: a post-hypnotic trigger fails to trip, witchcraft and double-crossing tangle his trail . . .

If a society of robber-barons whose whim was law made for stability in the past, is there any valid reason why a society of gang-lords can't do the same for the future? Maybe we're beyond all that: but it's still a fascinating book.

SCIENCE-FICTION ADVENTURES IN DIMENSION, edited by Groff Conklin. Vanguard Press, New York. 1953. 354 pp. $2.95

This anthology shows Groff Conklin back in his very best form (as he is also, by the way, in his—and Mrs. Conklin's—"The Supernatural Reader," Lippincott, 349 pp., $3.95; of which, as pure fantasy, I'll say no more).

It's a theme anthology, as the title indicates. Fourteen stories deal with time travel; nine with parallel-worlds. The oldest story is Dr. Miles J. Breuer's neglected brush with semantics, "The Gostak and the Doshes," back in 1930—fifteen years before "Null A." The newest is Murray Leinster's comedy, "The Middle of the Week After Next," which Bleiler and Dikty tapped as one of the best of 1952.

I can't, at this late date, summarize all twenty-three stories for you, but I will try to indicate the organization, which adds up to as nice a summary of dimensionality as I've seen.

Four stories—Sturgeon, Bade, Leinster, del Rey—deal with time travel into our future; four more—Chandler, Gross, Long, Sell—with travel to the past—"The Good Provider" is the little gem here. Two, by Day-Keene and Ray Bradbury, bring the past to the present; Gold, Hull, Padgett and Jones round out the picture by invading the present from the future.

As for "dimensions" of other sorts, it's even harder to find a favorite among stories by writers like Cartur, Breuer, Asimov, MacDonald, Nourse, Temple, Young, Leiber, and Frank Belknap Long—t'other was Amelia. Some of them are more fantasy than science-fiction, in that they don't seek an explanation in the prosaic. For pure story, I think I like John D. MacDonald's "Ring Around the Redhead"; for inevitability Alan Nourse's "Tiger by the Tail."

In its league—excluding pocketbooks and the Bleiler-Dikty annual—this looks like the top anthology of 1953.

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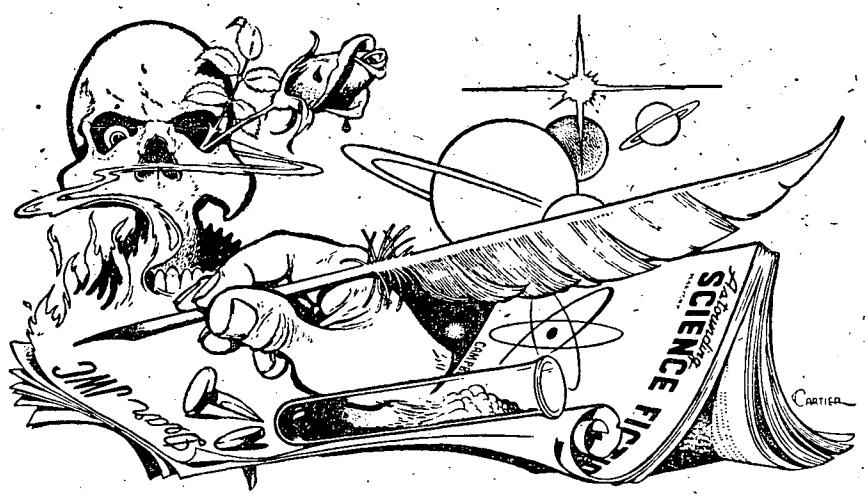

BRASS TACKS

Dear Mr. Campbell:

Scientific Fiction is fiction based upon the factual in scientific knowledge plus the infinite speculative possibles built upon that knowledge.

Is this a fair definition?—John Litster, Box 537, Rt. 1, Gold Hill, Oregon.

Yes!

Dear Sir:

Dr. Asimov is to be complimented on his discovery of the bi-temporal nature of the carbon atom, and you are to be congratulated on its publication. This concept should have far reaching effects, especially if it is found that other atoms have a similar nature. For example, it might explain why that silicone known as "Silly Putty" can't make up its mind whether to be a solid or a fluid, if it is one thing in the past and another in the future, simultaneously.

Further research will probably disclose that there are some carbon atoms with *two* bonds in the future and the other two in the past. This would lead to the situation in "Alice" that produced jam yesterday and jam tomorrow but never jam today.

I await future developments with lively anticipation.—R. P. Courtis, 531 Meadow Lane, Falls Church, Virginia.

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You can't have two bonds in the future; such an orientation would, because of bond-angles, force both bonds into an angle-position with respect to the line of True Time. This is known as the "if it were," or conditional contrary to fact, position.

Dear Sir:

Your editorial, "Intelligence Test," was up to your usual standard, i.e. both interesting and thought-provoking. It helped me to condense certain nebulous ideas of mine about the basic nature of the human mind.

The way I see it the human mental processes consist of two basic functions, intelligence and memory. These I believe to be completely separable and individual functions.

Memory is the ability to store information, and to reproduce this information at a later time. The practical memory unit yields a reproduction which is subject to accompanying distortion and loss of fidelity, which are the limiting factors in the usefulness of the memory unit. Lack of fidelity is a loss of part of the input information, and distortion is a meaningless output which originated in the memory, thus was not part of the input. A tape recorder is an example of a fairly good memory, it can remember atmospheric pressure variations within certain frequency and intensity ranges, and can reproduce these variations at a later time. The useful frequency and intensity ranges are determined by the allowable distortion and loss of fidelity.

Intelligence is the ability to take two or more input items of information and to correlate and resolve them, if such is possible. This correlation and resolution will result in meaningful output information not explicit in the input. This is the difference between distortion and intelligence. Distortion produces meaningless output, while intelligence produces meaningful output, neither being explicit in the input, and both being partly functions of the input and partly functions of the handling circuits.

(Distortion seems to be partly a function of the complexity of the unit. An analogue computer is relatively simple and gives only an approximate solution. A digital computer can be made as exact as desired, i.e. its distortion can be reduced to as small a value as desired, but at the expense of increasing complexity. However the human mind, a marvel of complexity, is capable both of amazing distortion and amazing precision).

Intelligence and memory tend to be confused because of their functional relationships. Memory can be utilized without any intelligence whatsoever being present—e.g. the tape recorder. Unfortunately the use of intelligence necessitates the use of memory. This is due partly to differing speeds of computation in different circuits, and

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partly to the need for reference to previous results or to the input information. If two results are to be compared, the quicker result must be stored until the slower result arrives, or the input items must be stored until no further reference to them is required.

This inability to use intelligence without using memory renders impossible any test which would be purely an intelligence test. However a purely memory test would be possible, and if the result of such a test was used in evaluating the result of a combined memory-intelligence test, then a real intelligence quotient should result, provided, of course, that the two tests were properly constructed, administered, and interpreted. O.K. you psychologists, there is a basis for you to work on, the mere details of testing methods I'll leave up to you. After all, who am I to tell you your business?

Thank you for "The Scientist." That piece badly needed writing.

I wish you would collect the last five years, at least, of your editorials and put them out in book form, with or without revision. A bundle of magazines is not either a convenient or a permanent way to save information. —Ivan C. Smith, 16 Tower Road, Halifax, Nova Scotia.

The editorials are shorter than you think, and many are outdated. They wouldn't make a booklet, let alone a book!

Dear John:

The December ASF brings up a few points which seem to be related and which I can't refrain from commenting on. But first, for the AnLab:

1) Ill Wind: Very good. I'd like to see more science fiction of the near future, written by men who have such an intimate acquaintance with what's going on in their field today. In some ways, that type of story remains the most stimulating.

2) Hide! Hide! Witch!: Nice extrapolation.

3) Mother of Invention: Hm-m-m, I dunno. Where did that energy come from? And by the way, I should think the effect of diamond dust on the respiratory system would be pretty rugged. Still, a good yarn.

4) Counterspy: See comment on "Ill Wind."

Seems to me thiotimoline has industrial possibilities, in reducing the time-lag of various machines and circuits. How about it, Isaac?

The editorial was, as usual, excellent; but perhaps a little expansion on the subject of natural laws is called for. The distinction between *man-made* and *man-found* laws is not at all a clear one, as Poincaré showed many years ago.

Take, for instance, Newton's first and second laws—rather, the second, the first being really a special case of it. Does the equation F: ma do more than *define* force? Mass and acceleration can be measured more or less

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directly; the product of these two quantities (in the CGS system) we then call the "force" acting on the body of mass m to produce acceleration a . . . But wait, it isn't that simple either! For how do we measure mass? By comparing the *force* a body exerts on, say, a balance, with the force exerted by some standard body, both in the Earth's gravitational field. So which comes first, the chicken or the egg?

Likewise, the conservation of momentum involves an underlying assumption of absolute rest—somewhere in the universe, a point exists which can be taken as completely motionless—which Newton's contemporary Leibniz realized on logical grounds was meaningless.

The best example of what I'm driving at is given by the most fundamental law of all, the conservation of energy. Energy itself can't be detected, if you stop to think about it; only its effects. As Eddington has remarked, ultimately all scientific data reduce to readings of a pointer on a scale or something similar. And if something happens which apparently violates the conservation of energy, we do not throw the principle overboard; we *invent* "potentials," or "fields," or the like to account for the discrepancy. For instance, if two otherwise ordinary iron bars suddenly move together, we say one is magnetized. Or: the neutrino was postulated to explain certain radioactive

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phenomena which would otherwise have violated the principle. And if a Waldo should suddenly make aircraft fly without using their engines, we'd soon decide that he had them drawing energy from "somewhere else," or tapping a hitherto undiscovered "potential."

This does *not* prove that science is a tissue of elaborate fictions. It does show that in building a system of explanations, we have to start somewhere, have to set up our postulates, hypothetical entities, and undefined terms; even in the realm of pure theory, there must be ostensive definition. The most basic natural laws are not observed regularities of nature so much as they are *conventions;* we hang on to these conventions at all costs, even the cost of inventing new hypothetical entities like the neutrino, because in the long run they work. The neutrino, for example, starts out as a device to save the conservation of energy; but recently it has also been used to furnish a plausible explanation of supernovae, and sometime in the future it will probably also be used to explain clicks or needle quiverings in an instrument labeled "neutrino detector."

No matter what observed phenomena turn up in the future, I doubt that science will ever abandon the conservation of energy; because ultimately, it is the most rigorous form of the causal law on which the scientific method is based. Conservation of energy is a statement of a certain invariable relationship between sets of data; what else is causality, and what else is it science tries to find? (Even the Heisenberg uncertainty principle expresses a type of invariable relationship, and it operates within the framework of the conservation law.)

To repeat and summarize: the most basic laws of nature we can find are *conventions;* they are the scientific language itself. It's meaningless to argue whether they "really" exist in the universe; in the nature of the case, all we can verify is that these conventions, this language, enable us to summarize broad relationships between data and to make accurate predictions.

Which, of course, brings up the general subject of language, as touched on in this month's Brass Tacks. To begin with general semantics and the Aristotelian-vs.-null-A argument: the law of excluded middle (everything is either A or not-A), which is the basis of the whole Aristotelian system, is another case of a convention, this time on the linguistic level. *By the nature of our language,* it is as meaningless to say, "This uniformly colored patch is both red and green," as it is to say, "This house is nine feet blue smell of violets." The definition of the terms "red," "green," and "uniformly colored" makes the statement meaningless. It is *not* an empirically meaningful—and therefore, in princi-

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ple, disprovable—statement that "No uniformly colored patch is both red and green." It is a logical tautology, and therefore *necessarily* true—in our language.

"Two plus two equals four" is another necessary truth. In actual fact, cases can be found where it is apparently not true: for instance, if two raindrops on a windowpane meet two other raindrops, and they melt together into one big raindrop. But in reality, this does not disprove the law about addition of two and two, which is not properly applicable to this case. Again, it's a matter of convention; our language is so set up that no valid situation *can* be described in which two and two do not make four.

Certainly there are non-Aristotelian logics, and they work; but they always include Aristotle's system as a special case, and they *always* include the principle of non-contradiction. The reason for this is simple: it can be shown that any logic which does not include "P or not-P" can be used to prove anything whatsoever; therefore it is useless for any practical purpose.

To Mr. Wolff's statement, "a bucket of water is either hot or not hot," Mr. Martin asks: "How hot, for how long, in whose opinion, and under what circumstances?" His puzzlement is due to confusion of the logical (or linguistic—same thing) and empirical levels. Empirically, we observe a gradual fall of the temperature of the water; in principle, we could

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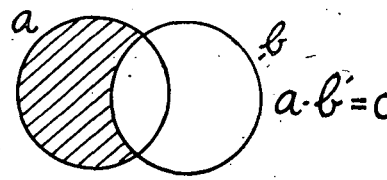

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observe anything, e.g. the water boiling in one part of the bucket and freezing in another part. But this does *not* affect Mr. Wolff's sentence, which is a logical tautology—necessarily true, but devoid of empirical meaning. In practice, to make the sentence useful, we would have to define "hot" by some such means as "having a temperature of one hundred degrees Fahrenheit or greater, within the limits of observational error." Likewise, if we wish to make the statement, "This piece of cloth is either red or not red" useful, we have to define "red" by some specified distribution of wave-lengths.

In short, you can put me down as a modified Aristotelian on the grounds that Aristotle's basic principles are embodied in the Indo-European languages, and that a hypothetical language which did not include them would be scientifically useless because it would not be able to prove or disprove anything logically.

The structure of the European languages seems extremely well adapted to the expression of empirical, verifiable relationships; that is doubtless an accident of linguistic evolution, but may be one reason why the European peoples, from the early Greeks to the present day, have had the lead in scientific development—as contrasted to the rule of thumb which marked most earlier advances. I'm told that Chinese is so clumsy in this respect that Chinese scientists and engineers generally use English or French in their professional discourse and journals. (By the way, I don't mean to snub any other language groups; each of them has its own strong points, and as far as logical structure goes, I understand that modern Turkish is so logical as to make old-fashioned oratory impossible!)

Which brings us down to English, specifically, and to your answer to Sprague de Camp's letter. I quote you: ". . . When a scientist finds a consistent pattern in phenomena, he looks to see if there is a cause. *Why* have English-speaking people written stuff worth reading? Why did Joseph Conrad pick English? Why did English-speaking people so consistently shoot straighter? I'll be darned if I know, but there must be some reason!"

Personally, I go on the principle that in history there are no unique causes; there is never *a* reason why something happened, but a whole complex of reasons, interacting in part and independent in part; sheer chance has undoubtedly had an enormous role in history. (The accident that Alexander of Macedon inherited a particular set of genes right after his father had made Macedon a world power. . . .) Strictly speaking, I don't believe the Anglo-Saxons did shoot any straighter—vide the Boer War; but for a complex set of reasons involving geography, coal deposits, the deforestation of Europe, the family stupidity of the Bourbons, . . . et

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cetera, Britain had taken the lead and was able to put more and better-trained manpower into the field, backed by more and better armament. Thus she booted the French out of India and America, while her sea power planted colonies around the world and her diplomats—with a lot of luck to help them—kept the Continental nations from ganging up on her. In short, the Anglo-Saxon world predominance was more a matter of geography, politics, and temperament, than it was of language.

English is a noble tongue, though, and no few foreign-born writers have elected to use it; in Conrad's case, he became a British citizen, after all. Certainly English-speaking peoples have written stuff worth reading, but so has everybody else. In fact, at present only the French seem to be doing much with the short story. But English has produced an unusual number of masterpieces—again, probably for reasons of fortunate history and sheer accidental birth of geniuses—so that there is considerable motive for all literate people to learn it.

Spelling reform is a nice but, I fear, somewhat quixotic idea; we're only likely to get it by decree of a dictator, which would hardly be worth the price. And regularizing the creaky grammar would put us in the somewhat ridiculous position of needing translations of our own classics—the Norwegians have gone to that extreme, and have to take a lot of kidding for it.

By the way, Sprague, it wasn't the pronunciation but the spelling of Copenhagen which was a matter of controversy in Denmark. The recent Danish spelling reform was a rather minor one, involving mostly the dropping of capitalized common nouns and the adoption of one new letter;

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the older orthography is not considered incorrect, merely unofficial. One point which baffles me about the new system: in referring to the Trinity, "Father" and "Son" are still capitalized; but "Holy Ghost" is not!

Enough for now. In fact, probably much too much.—Poul Anderson.

There undoubtedly are pure accidents in history—but when favorable accidents become a habit, we tend to want an explanation beyond "accident." And it is remarkable what a long series of favorable accidents have happened to English-speakers! Including the "accident" that Joseph Conrad "happened" to choose to become an English citizen:

Dear Mr. Campbell:

The letter from W. Fritz in your January issue describes *thinking* as a "process changing the future to suit the owner of the thinking device," and according to your comment, you feel that this is an excellent and highly interesting definition of the term. Something very similar to it has been proposed by psychologists as a definition for *intelligence*, though, in practice they use the term *intelligence* merely to denote the ability to pass what they call "intelligence tests."

There is no real objection to attaching new or unusual definitions to old terms, provided that, in context, their new meaning is made clear; but the term *thinking* and its equivalents in various languages, has for millenniums been used in contexts which make its meaning abundantly clear. Before modern confusions mixed it up with deduction, calculation, reasoning, computing, et cetera, the term *thinking* stood for the singular act of making nonsense groups!

Making a nonsense group comprises assigning a relationship where no relationship is discernible to any of the physical senses. Language is one product of our ability to make nonsense groups. Thus, the word "chair," for example, bears no physically discernible relationship to the object it denotes but forms with it a nonsense group. The word "thing" relates all entities in the universe to one another—the ultimate nonsense group! *Thinking*, in classical usage at least, can be defined as the act of making such nonsense groups.

The relationship between the elements in a nonsense group is a created relationship; that is, it comes into existence by being willfully assigned. *Thinking*, therefore, has been recognized as a creative act, because it creates relationships. The act of detecting, finding, discovering, et cetera, relationships is denoted with such terms as, deducing, calculating, reasoning, computing, and so forth.

So far as we know, the ability to willfully assign relationships, the creative act we have called *thinking*, is peculiar to mankind. Indeed, nomi-

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nalists have argued convincingly that the entity Man can be defined as that which *thinks*, irrespective of physical form. We know of no animal or mechanism which is able to *think*—that is, able to make nonsense groups—other than the human animal mechanism. If there were such an animal or mechanism, then in classical terminology, it would be a Man—its bodily form being of no consequence, by definition.

The ability to make nonsense groups has given mankind a tremendous intellectual advantage over other creatures on earth. Even if language were all it had produced this would still be true. There is, however, a growing tendency to suppress the ability to think in favor of the ability to compute, deduce, calculate, et cetera, which, basically, is the reason (I believe) for modern attempts to redefine the term *thinking*. I do not mean to belittle the ability to compute, but I would point out that if we carry it to its ultimate, and lose the ability to make nonsense groups—the ability to *think*—we revert to animals! — F. Sutherland Macklem, 1054 Hunter Avenue, Valley Stream, New York.

"Thinking"—"Thing-ing"?

Dear Mr. Campbell:

Some comments on the December, 1953 Astounding:

"Mother of Invention" furnished a lot of suspense as our fortune-seeking heroes came nearer and nearer to finding their "place in the sun!"

I liked the way they finally attacked their problem. It reminds me of a basic "must" of science: "Speculate boldly." Conservatism is quite in order when testing postulates and theories—but not when "hatching" them.

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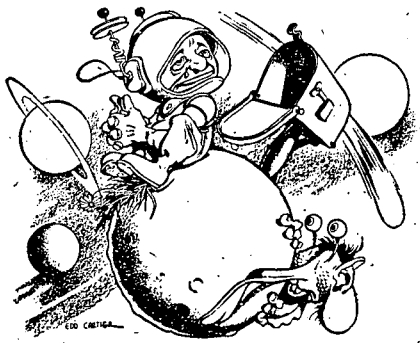

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The story raised a burning question, however: If the air of Planet Aurora was loaded with diamond dust, wouldn't the castaways' respiratory systems have been ruined along with their machinery?

The sad condition of society as depicted in "Hide! Hide! Witch!" may be the Shape of Tomorrow. I wonder, though, if such an apathetic populace would be capable of a powerful unified revolt against "Operation Bossy." It seems more probable that the people, for the most part, would accept Bossy with resignation. Even with tired enthusiasm, perhaps, for here would be an infallible Machine to solve their problems and relieve them of many worrisome responsibilities. This would seem to me to be in keeping with their cultural "conditioning."

Certainly the world of "Hide! Hide! Witch!" would naturally be hostile toward Joe Carter the telepath if he were known as such. I couldn't imagine telepathy "circulating at par" in any society constructed along the lines of this one—in which the greatest and most common source of fear is, "Suppose they find out!"

One of tomorrow's clichés may be, "Nobody loves a telepath!"—Hal J. Martin, San Jose, California.

Like the rubber valves in their pumps, human flesh by being soft, does not fight diamond hardness. Granite dust is much harder than human skin, but here on Earth we live comfortably.

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Continued from Page 7

span, either, without relay-repeaters. Perhaps we could better understand what the problems of living cells, and of old age are, if we applied Information Theory. The cells are seeking to transmit, undistorted, an exceedingly complex message, across an exceedingly great span of time. They are physical systems in the real physical universe—and they are inevitably going to have trouble with noise.

In Information Theory, the existence of noise is acknowledged, and the important criterion is the signal-to-noise ratio.

In maintaining the continuity of a species, the important criterion is the normal-to-mutation ratio.

Now in any individual human being, cells wear out, and are replaced by supposedly-identical daughter cells. If there were no noise in the Universe, once adult life had been reached, the cells would simply duplicate themselves perfectly. Sadly, noise *does* exist. I suggest that aging can be directly compared with the degradation of a signal when sent through a long chain of repeater-relay stations; it is the accumulation and repetition of biochemical noise.

The vitality of an individual at any time may be simply a measure of the signal-to noise ratio in his metabolism. The life-span of an individual would then be determined by the time-span across which he can transmit his signal without losing it in the noise level. Factors tending to increase the signal-to-noise ratio would then decrease life-span, while factors tending to increase the noise level would decrease the life-span.

Signal-to-noise ratio can be degraded either by loss of signal, or increase of noise.

Now a cornet does make music—signal—out of pure noise; a favorable mutation is a bit of noise that has

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somehow been added, and added in a useful manner. Signal can be increased by noise—it's just an exceedingly unlikely procedure.

This consideration suggests that intelligence—which is a mechanism for extracting useful information from the random occurrences of the Universe—would tend to increase life-span. Such things as antibiotics, sanitation, surgery, and education definitely have increased life-span. But misapplied intelligence, like a mis-played cornet, increases the noise level; atomic bombs, bacterial warfare, and automobiles with incompetent drivers are noise-factors which decrease life-span.

Antibiotics can attack noise-sources like germ disease organisms—specific noises, so to speak. But senility is inherently different.

If the noise-theory of senility were correct, it would have some interesting implications. Efforts have been made to isolate an "age factor," a biochemical compound of some sort, that might be the cause of old age.

The search would be like the effort to trisect the angle, or to transmute metals by chemical means. Inherently futile. *Any* compound isolated would be the wrong answer; noise is noise because it is not purified; purifying noise simply causes it to be something else. Noise is lack-of-organization; it can't be isolated, and an effort to do so is attacking the problem at the wrong level.

The "degenerative diseases" are the ones that make up the syndrome of old age. Information Theory suggests, at least, that they are, indeed, degenerative—the degradation of the signal-to-noise level in the organism.

Now suppose we could develop a serum which, when injected, would restore my tissue cells to exactly the condition they had at age twenty-five.

Fine—except that that would mean the loss of everything I've learned since then. All my experiences, my learning, my desirable alterations would go along with the undesirable ones. Then any drug, serum, or what-have-you that restores the *status quo ante* is not going to be popular with anyone who has not already lapsed into the final coma.

The effort to find an elixir of youth is another one of the ancient, and classical, frustration problems; it is inherently impossible of solution—at the level of a chemical elixir.

Sadly, it appears that the only possible approach to eternal youth is the method of devising a way of distinguishing between signal and noise. This is commonly referred to as "sense and nonsense" discrimination, and the term "judgment" is applied to the process.

To date, however, no one has defined what that process called "Judgment" is. Maybe we can give it a sort of description, anyway; we could say that Judgment is the Elixir of Youth.

Not that that helps much!

THE EDITOR.

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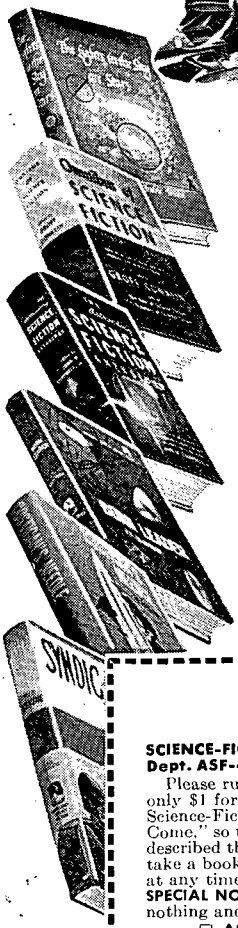

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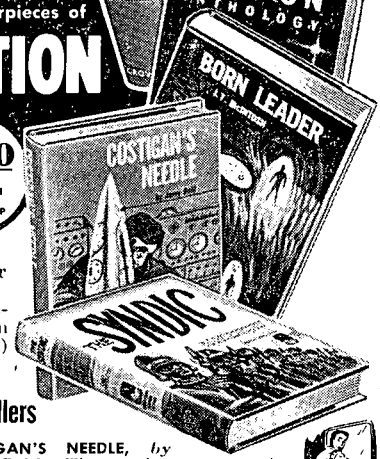

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